A STUDY ON IMPLEMENTATION AND PROMOTION OF HYBRID SOLAR WIND ENERGY-AN ECO FRIENDLY SYSTEM IN COIMBATORE CITY

By

A.NATARAJAN

Roll No. 0701MBAO320

Reg. No. 68107101112

A PROJECT REPORT

Submitted to the

FACULTY OF MANAGEMENT SCIENCES

In partial fulfillment for the award of the degree

of

MASTER OF BUSINESS ADMINISTRATION

CENTRE FOR DISTANCE EDUCATION

ANNAUNIVERSITY CHENNAI

CHENNAI 600 025

APRIL 2009

BONAFIDE CERTIFICATE

BONAFIDE CERTIFICATE

Certified that this project report titled "A STUDY ON IMPLEMENTATION AND PROMOTION OF HYBRID SOLAR WIND ENERGY - AN ECO FRIENDLY SYSTEM IN COIMBATORE CITY" is bonafide work of Mr. Natarajan. A who carried out the research under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

Signature of student

Name: NATARAJAN.A

Roll No: 0701MBA0320

Reg No: 68107101112

Signature of Guide

Name: SANGEETHA.S

Designation: Lecturer

Address: KCT-Coimbatore

Signature of project – in– charge

Name : Dr.S.V.DEVANATHAN

Designation : Director

Address : Kumaraguru College of Technology,

Coimbatore-641 006, Tamil Nadu.

DIRECTOR
KCT BUSINESS SCHOOL

VIVA–VOCE-Examination

CERTIFICATE of Viva–voce-Examination

This is to certify that Thiru. **NATARAJAN.A**

(Roll No. **0701MBA0320** ; Register No. **68107101112**) has been subjected to Viav-voce-Examination on 10.5.09 (Date) at 12.30 (Time) at the Study centre **Kumaraguru College of Technology, Coimbatore-641 006, Tamil Nadu**

:

Internal Examiner

Name: Miss.SANGEETHA.S

Designation: LECTURER

Address. : KCT-BUSINESS SCHOOL -CBE

External Examiner

Name : DR. K. RAMAMOORTH

Designation : PROF & HEAD, DEPT OF

Address : COIMBATORE INST. MGMT & TE

Project Coordinator

Name : Dr.S.SADASIVAM

Designation : Dean (Academic)

Address : Kumaraguru College of Technology,

Coimbatore-641 006, Tamil Nadu.

CO-ORDINATOR
KCT STUDY CENTRE
CDE ANNA UNIVERSITY, CHENNAI
KUMARAGURU COLLEGE OF TECHNOLOGY,
COIMBATORE 641 006.

ABSTRACT

ABSTRACT

The work presents the design and building of a hybrid solar and wind powered system. This will provide electricity to a zero generating cost. The hybrid energy system is to be located in Coimbatore city. The system is intended to increase the viability and deployment of renewable energy technologies and also to provide valuable information on the benefits of the technology the society at a large. The proposed system will serve as a practical demonstration of the operation of a combination of solar wind energy sources. Implementation of this system would promote an Eco-friendly Coimbatore city.

The proposed project is expected to deliver up to 4,200 watts of electric power from an array of photovoltaic (PV) solar modules and wind turbine generator. This hybrid system shall be widely used in homes, hostels, industrial lighting, village electrification, agricultural water pumping system, telecom applications, mini software industry, school and college lighting system, computer centers and call centers.

While comparing with the existing power technology, the project survey the limitation of pollution free from hygienic application held at Coimbatore. In the project, Exploratory Research method had been used to get the precise ideas for it's fulfill requirements. Using cost benefit analysis tools the customer satisfies full output from our system and gained in the positive approaches incessantly.

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

It is inevitable that thoughts and of other people tend to drift into the subconscious when one feels to acknowledge helping derived from others. I acknowledge to all those who have helped me in the preparation of this project work.

I wish to express my sincere thanks to **Director, Centre for Distance Education, Anna University-Chennai**

I wish to express my sincere thanks to **Dr.S.SADASIVAM, Dean (Academic),** Kumaraguru College of Technology, Coimbatore and Coordinator, KCT Study Centre, Coimbatore

I wish to express my sincere thanks to **Mr.A.SENTHIL KUMAR, Faculty-Finance,** KCT Business School, Kumaragur College of Technology, Coimbatore and Counselor - MBA Programme, KCT Study Centre, Coimbatore

I privileged to have worked under the immense and ever strengthening support of our project guide **Miss. S.SANGEETHA, LECTURER**, KCT Business School .I thank for his constructive criticism and keen interest throughout the completion of my project

I wish to express my sincere thanks to **Prof. K.R.AYYASWAMY** -KCT Business School, for his continuous encouragement throughout my project.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKROUND

Today's there are lot of commercial nuclear power plants in the world. These produce about 20 percent of our electricity. About 440 nuclear power plants supply about 16 percentage of the world's electricity. All these plants use uranium 235, which makes up only 0.7 percentage of natural uranium. In a U235 power plant, only 1% of the energy is recovered; the rest is nuclear (radioactive) waste. If the number of this kind of nuclear plant were increased to provide about 40 percentage use of fossil fuels, all known uranium deposits would be mined and used in about 30 years. Nuclear power plants are neither a long term nor short term solution of the world energy needs.

Three types of uranium occur in nature: uranium-238, which accounts for approximately 99.3 percentage of all natural uranium; Uranium 235, which makes up about 0.7 percentages; and uranium 234 which makes about 0.005 percentages. Uranium 235 and uranium 238 are two naturally radioactive isotopes of uranium. Uranium 235 is the only naturally occurring fissionable material and therefore is essential to the production of nuclear energy. Uranium is processed (called enrichment) to increase the concentration of Uranium 235 from 0.7 percentage to about 0.3 percentage produces enriched uranium, which is used as fuel for the fission reaction.

Standard reactors have a lifetime of about 30 years after which they have to be decommissioned. Since so much of the power plant is radioactive by this time, decommissioning is a serious problem. Decommissioning or modernization of a nuclear power plant is a controversial part of the uranium cycle with which we have little experience. Contaminated machinery must be disposed of or stored so that environmental damage will not occur. Decommissioning or refitting will be very expensive and is an important aspect of planning for the use of nuclear power. It is possible that dismantling of old decommissioned reactors may become one of the highest costs for the nuclear industry. The resulting radioactive wastes await a place to store them for 10,000 plus years.

Uranium mining also creates radioactive wastes. Mine tailings (Material that are removed by mining activity but are not processed and remain at the site) from uranium mines and mills must also be considered hazardous.(For example:- in the western united states more than 20 million metric tons of abandoned tailings will continue to produce radiation for at least 100,000 years)

Alternative Energy

The estimated recoverable energy from solar energy is about 1,000 times the present human global energy consumption of 10 TW per year .Ten weeks of solar energy is roughly equivalent to the energy stored in all known reserves of coal, oil, and natural gas on earth. Solar energy is absorbed at earth's surface at an average rate of 120,000 TW (one TW is 1012 W), which is 10,000 times the total global demand for energy.

We only need to be 0.1 percentages efficient in converting solar energy to usable energy for sunlight to provide the present world consumption of fuels. Present photovoltaic devices (that convert sunlight to electricity) are 10 percentages efficient. If we would only be able put solar energy devices on 1 percentages of the area where there is recoverable solar energy, all the world's energy needs could be met with solar energy alone. The technology to do exists now.

If we were able to put photovoltaic devices on 10 percentages of the area where there is recoverable sunlight, in two years enough electricity would be produced to equal all known reserves of coal, oil and natural gas. If we only used 1 percentage of the recoverable at 10 percentages efficiency, it might take 20 years to produce electricity equal to all known reserves of coal, oil and natural gas.

Wind energy provides similar potentials. It's believed that there is sufficient wind energy to satisfy the electricity needs of the entire world. Wind energy is about one-third of that produced from a large fossil fuel of nuclear power plant. The cost of producing the electric energy is very low, compared to as mush as Rs 5.50 per unit of electricity from burning natural gas.

1.2 IDENTIFIED PROBLEM

The current core issue faced by Tamilnadu is interrupted power cuts. This project strives to rectify the major crisis with the support of hybrid solar-wind power generation system. It mainly focuses reduction of power cuts in household and small scale industrial consumption. Solar and wind power in the home are probably the most widely used forms of alternative energy. When used in conjunction they form a totally green, round the clock hybrid energy system. They can even be wired into the utility grid connected system to supply the majority of your energy needs while the utility company functions as your backup energy source.

The demand for alternative energy sources is increasing each year due to need for clean and renewable sources of energy.

So, by providing this technical feasible and financially viable modern and powerful renewable energy in the world, the overall system efficiency will be increased to maximum extend and the ECO-FRIENDLY status of world will definitely improved.

1.3 NEED FOR STUDY

The demand for alternative energy sources is increasing each year due to need for clean and renewable sources of energy.

So, by providing this technical feasible and financially viable modern and powerful renewable energy in the world, the overall system efficiency will be increased to maximum extend and the ECO-FRIENDLY status of world will definitely improved.

1.4 OBJECTIVE AND SCOPE

- To study the existing power generation system
- To identify the problems related with existing power generation system
- To suggest alternate renewable energy which encompasses pollution free, low operational and maintenance cost

1.5 DELIVERABLES

To suggest an alternate renewable energy which supports the following features: -

- Pollution free environmental
- No fuel required
- Low operational and maintenance cost
- Less space
- Easy installation, less time consumption

CHAPTER 2

LITERATURE SURVEY

CHAPTER 2

LITERATURE SURVEY

2.1 REVIEW OF LITERATURE

Below is the review most cited literature on technical analysis

J.J DING AND J.S BUCKERIDGE (2000) [1] observed that technical analysis, also known as charting, has been part of design considerations for a sustainable hybrid energy system. Commonly hybrid energy system use solar and wind energy sources, although most of the renewable energy available on earth consists of different forms of solar energy. A system using a combination of these different sources has the advantage of balance and stability. For instance, winds are usually relatively strong in winter and solar radiation is higher in summer .A balanced system provides stable outputs from sources such as these and minimizes the dependence of output upon seasonal changes; furthermore, it optimizes utilization of the different renewable sources of energy available. Given the fact that a hybrid energy system consisting two renewable energy sources has the advantages of stability, the objective of lighting pathway at the project site can be achieved by making use of the wind and solar energy sources. The information about local wind and solar energy sources indicates that feasible hybrid energy system can be planned, modeled and designed for the above purpose. The collected data of the various energy sources was analyzed in order to plan for the structure of the system.

[1] ***J.J DING AND J.S BUCKERIDGE (2000).****"A journal of design considerations for a sustainable hybrid energy system"IPENZ Transactions, 2000, Vol 27, No.1*

Dr. Recayi Pecen, Dr. MD Salim, & Dr. Marc Timmerman (July 2000) [2] observed that technical analysis; Iowa is a geographically large state with a low population density. Electrical power needs are supplied by a large number of local power companies. Due to the isolation of many dwelling, agricultural sites, and industrial sites. There is considerable interest in novel forms of electricity production. Two Such forms of production are solar photo-voltaic (PV) cells based on DC power Generating arrays and wind turbines based on propeller-driven DC power Generators. In fact, Iowa is now the home of the largest wind-turbine Power installation in the world (Pecen, 1999). Electrical power generation and Special sources of electric power, like wind-turbines, are frequently discussed in the public media. The additional factor of the general concern and interest for environmental issues is a further enticement to attract the student's interest in these "green-technology" forms of electricity generation.

S. Lakeou, E. Ososanya, Ben O. Latigo (2007) [3] observed that technical analysis, the proposed hybrid solar wind power generation system appears to be well suited for the zero energy visitors' center, which will be constructed by summer 07. With the exception of the single pole mounted, fixed tilt solar array that will be erected soon, all the other components are fully operational. To date, tests were conducted by supplying power to the submersible pump, which was shown to visitors at various instances.

[2] ***Dr. Recayi Pecen, Dr. MD Salim, & Dr. Marc Timmerman (July 2000).***"*A journal of industrial technology volume 16, No.3*

[3] ***S. Lakeou, E. Ososanya, Ben O. Latigo (2007).***"*A journal of 22nd photovoltaic solar energy conference, September 2007*

KEON ATKINS, JACOB HENDERSON AND SHANDA STANLEY (2008) [4] observed that analysis, the overall performance of the hybrid renewable energy system was as expected. We were able to determine that this system would be a viable source of power production for outdoor and remote area applications. Due to time constraints some additional alterations could not be made to the wind turbine in order to get optimal performance. If time were available for further alterations the size of the stepper motor used should have been increased. Further improvements that should be made are in the portability of the entire system and materials used to construct the thermoelectric refrigerator.

M.MURALIKRISHNA AND V.LAKSHMINARAYANA (2008) [5] observed that analysis, Hybrid power system can be used to reduce energy storage requirements. The influence of the Deficiency of Power Supply Probability, Relative Excess Power Generated, Energy to Load Ratio, fraction of Photovoltaic and wind energy, and coverage of Photovoltaic and wind energy against the system size and performance were analyzed. The technical feasibility of Photovoltaic-wind hybrid system in given range of load demand was evaluated. The methodology of Life Cycle Cost for economic evaluation of stand-alone photovoltaic system, stand-alone wind system and Photovoltaic-wind hybrid system have been developed and simulated using the model. The comparative cost analysis of grid line extension energy source with Photovoltaic-wind hybrid system was studied in detail.

[4] *KEON ATKINS, JACOB HENDERSON AND SHANDA STANLEY (2008)."A journal of Pasqualetti, Martin J. Wind Energy: Obstacles and Opportunities. Volume 46 Number 7, January 2004, p 24-38.*

[5] *M.MURALIKRISHNA AND V.LAKSHMINARAYANA (2008)."ARPN Journal of Engineering and Applied Sciences, Vol 3, No.5, October 2008*

The optimum combination of solar Photovoltaic-wind hybrid system lies between 0.70 and 0.75 of solar energy to load ratio and the corresponding life cycle cost is minimum. The Photovoltaic-wind hybrid system returns the lowest unit cost values to maintain the same level of Deficiency of Power Supply Probability as compared to standalone solar and wind systems. For all load demands the live energy cost for Photovoltaic-wind hybrid system is always lower than that of standalone solar Photovoltaic or wind system. The Photovoltaic-wind hybrid option is techno-economically viable for rural electrification.

SUMITA MISRA, IAS DIRECTOR, Renewable Energy Department, Haryana (2008) [6] observed that analysis, Renewable energy electricity generation capacity reached 240 GW Worldwide in 2007.An increase of 50% over 2004 Now represent 5% of Global power capacity & 3.5% of Global generation. Total Global power capacity of all forms is 4300 Giga watts. Estimated United states $ 71 billion invested in Renewable energy Sector Worldwide in 2007, of which 47% for wind power and 30% for Solar Photovoltaic.

[6] ***SUMITA MISRA, IAS DIRECTOR, Renewable Energy Department, Haryana (2008)."****ICORE-october2008, Chennai*

2.2 RESEARCH GAP

In this research the wind energy is a separate power system and solar energy is a separate power system. The two non-conventional energies are merged together to produce the electricity for larger megawatts in this world. This is for existing technology. Now we can use for the two non-conventional energies to produce electricity for a lowest capacity (4200 watts), which is applicable for Coimbatore surroundings. Now in most wide areas especially in Coimbatore surroundings the power cut occurs frequently due to the shortage of electric powers. According to the needs our project gives the benefits of reduce the power cuts using the hybrid system.

While using our project name hybrid solar-wind energy power system, the customer for their applications would definitely saves 80 percentage of the electricity bill. Although the initial investment is low the regaining the payback period is quicker as possible.

CHAPTER 3

METHODOLOGY

CHAPTER 3

METHODOLOGY

3.1 TYPE OF PROJECT

- Exploratory research

SOURCES

- Secondary data is used in this study. (The data's are collected from the web sites)

Exploratory Research

The Exploratory Research briefly tells about the in-depth study of new technology, which undergoes multiple selection of process to get the final results. The major emphasis in such studies is on the discovery of ideas and insights. The study of research design gives appropriate and flexibility enough to provide opportunity for considering different aspects of problems that comes under study. If precise meaning is not given for the research procedure, the relevant data should be taken for completing it.

3.2 ASSUMPTIONS, CONSTRAINTS AND LIMITATIONS

- This project withstand for 10 years
- Time can be constraints for this project
- Limitation of secondary data it will be applicable for this project

3.3 TOOLS FOR ANALYSIS

- Cost benefit analysis
- Payback period

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 ANALYSIS (STATISTICAL TOOLS) AND INTERPRETATION AND DISCUSSION, INFERENCES

Hybrid solar wind generator maximum capacity in watts = 4200

Hybrid solar wind generator cost in Rs = 7, 00,000

Commercial Customers for every 2 months consuming electricity power in Units = 4500

The cost of electricity board per unit Rs = 5.50

The cost of hybrid system per unit Rs = Nil

Table 4.1.1 Amount Spent by Commercial Customers to the Electricity Board

Unit Consumed (2 Months)	Cost per Unit (Electricity Board)	Amount Spent by Commercial Customers to the Electricity Board	One Year	Amount Spent by Commercial Customers to the Electricity Board for one year
4,500	5.5	24,750	6	1,48500

Cash flow is 1, 48,500 for every year, So Present Value interest factor of an annuity of Rs 1 per period at 9% for 10 years.

Table: 4.1.2 Cash Flows

Year	Cash flow	Interest (i %) PV @ 9%	PVCI/PVCO
1 - 10	1,48,500	6.418	9,53,073
T=0	7,00,000	-	7,00,000
		Net Present Value	2,53,073

INTERPRETATION: -

From the above table 4.1.2 the given pictorial tabular column clearly explains the initial amount for the cash flow for the project explains below

1. Initial amount should be invested for the project cash flow is sum of **Rs. 7, 00,000** at the rate of interest is nil
2. During the continuous process of the every year the interest rate given by the bank is 9%

3. In the mean time period of every year the annuity cash flow value should be **Rs. 1, 48,500**
4. For the sequentional year the cash will be increased with corresponding cash flow and then after ten years the cash flow amount will be **Rs. 9,53,073**

   Finally the Net Present Value is positive for the clients and for all who used this for other application. Henceforth our project is strongly recommended.

Table: 4.1.3 To Find Out the Payback Period

Year	Cash Flow	Cumulative Inflows
0	-	0
1	1,48,500	1,48,500
2	1,48,500	2,97,000
3	1,48,500	4,45,500
4	1,48,500	5,94,000
5	1,48,500	7,42,500
6	1,48,500	8,91,000
7	1,48,500	10,39,500
8	1,48,500	11,88,000
9	1,48,500	13,36,500
10	1,48,500	14,85,000

Payback Period = $4 + \frac{7,42,500-7,00,000}{1,48,500} \times 12$

= 4 Years 3 Months

INTERPRETATION: -

From the above tabulation indicates 4.1.3 clearly indicates the payback period details.

1. Initial value of the year cost of no cumulative.
2. During sequential year the cash value added with the **Rs 1, 48,500** of the past value i.e. cumulative inflows.
3. This process continuous for 0 to 5 years.
4. In-between the year of 3 to 5 the original amount is brought from our initial amount. In this way the client get satisfies to get the amount duration with in a short period.

CHAPTER 5

CONCLUSIONS

CHAPTER 5

CONCLUSIONS

5.1 SUMMARY OF FINDING

This project clearly indicates the Net Present value is Positive using cost benefit analysis and Payback period is short. While comparing with the existing power technology, the project survey the limitation of pollution free from hygienic application held at Coimbatore. In the project, Exploratory Research method had been used to get the precise ideas for it's fulfill requirements. Using cost benefit analysis tools the customer satisfies full output from our system and gained in the positive approaches incessantly.

5.2 SUGGESTIONS & RECOMMENDATIONS

- Net Present Value is positive for the clients and for all who used this for other application. Henceforth our project is strongly recommended.
- In Karnataka government to produce the law in every building installation must use the 20 percentage of non conventional energy. The same law can be applied to Tamilnadu government.
- High awareness about the hybrid solar system has to be created through local media in general as well as to commercial customers in specific.
- The Coimbatore Corporation can have tie ups with banks to facilitate loans for commercial and domestic purpose.
- The hybrid wind-solar power system would help rural electrification in Coimbatore city (Example of places is karamadai, chinnakuily, bohampatti, panapatti and edyarpalayam...)

5.2 CONCLUSIONS

This study deals with analyses the feasibility of a hybrid solar-wind power generation system in Coimbatore. The cost benefit is Rs 2, 53,073 from the project which may be equivalent amount saved by the commercial customers. The hybrid solar-wind power system definitely would help Coimbatore city commercial customers from power cuts and smooth functioning of operations could be enabled. Although the application and implementation of renewable energy systems for commercial application with isolated grids are primarily dependent on the availability of the renewable resources on the specific site of interest, there are a number of economic considerations and design trade offs to be taken in order to optimize cost and performance. A thorough analysis of the site conditions and identification of site limitation is required to optimize the design and implementation of a hybrid energy system.

5.3 DIRECTIONS FOR FUTURE RESEARCH

A computer measurement and control bus will be added to the system. Computer controlled relays will be added to allow all the major elements of the system to be switched in and out of the system through computer programs. The measurement bus will be connected to all the major signals in the system and will allow for computerizes data acquisition simultaneously of all the major signals in the system. These improvements will allow for the study of more complex issues like power faults caused by sudden over voltages like lightning. These improvements will also allow the same benefits to instruction realize in electricity and electronics classes to be extended to control and instrumentation classes.

REFERENCES

REFERENCES

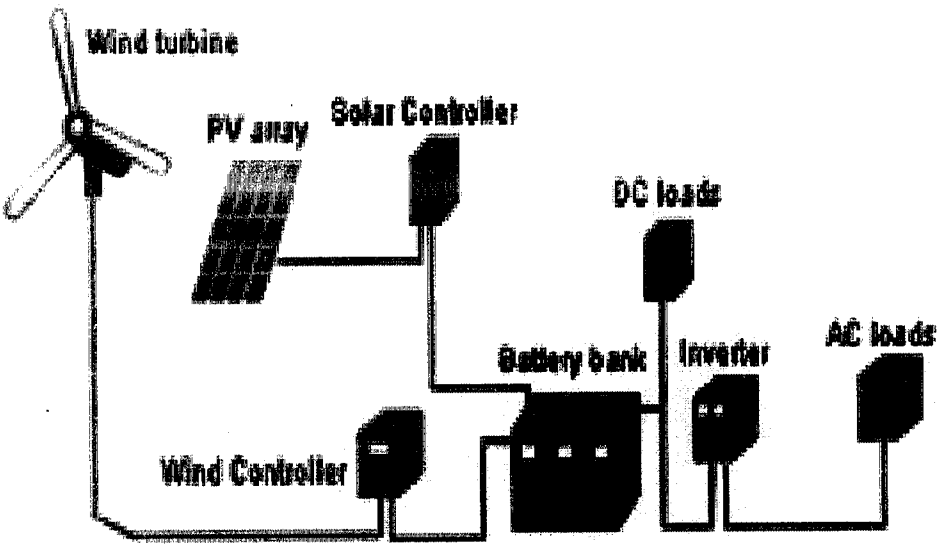
1. J.J Ding and J.S Buckkerid GE (2000), A Journal of design considerations for sustainable hybrid (http://www.ipenz.org.nz/ipenz/publications/transactions/Transactions2000/TransEMCh00/1ding1.pdf)
2. Dr.Recayi pecen, Dr. MD Salim, & Dr.Marc Timmerman (July 2000), A Journal of industrial technology Volume 16,No.3 (http://www.nait.org/jit/articles/pece051900)
3. S.Lakeou, E. Ososanya, Ben O.Latigo (2007), A Journal of 22 nd photovoltaic solar energy conference, September 2007-(http://cere.udc.edu/5BV.3.30.pdf)
4. Keon Atkins, Jacob Henderson and Shand a Stanley (2008), a journal of Wind energy obstacles and opportunities. (http://www.umflint.edu/csesp/Documents/AlternativeEnergy.ppt)
5. M.Muralikrishna and V.Lakshminarayana (2008), ARPN journal of Engineering and applied sciences, Vol 3, No 5, October 2008. (http://www.arpnjournals.com/jeas/research_papers/rp_2008/jeas_1008_131.pdf)
6. Sumita Misra, IAS Director, Renewable energy department, Haryana (2008) ICORE–October2008 (http://www.icoreindia.org/2008/pdf/ICORE%202008/Session%204/MsSumitaMishra)
7. Fundamentals of Financial Management, James C.Van Home,John M.Wachowicz Jr saumitra N. Bhaduri.
8. Research Methodology- Methods & Techniques, Second Edition-C.R KOTHARI

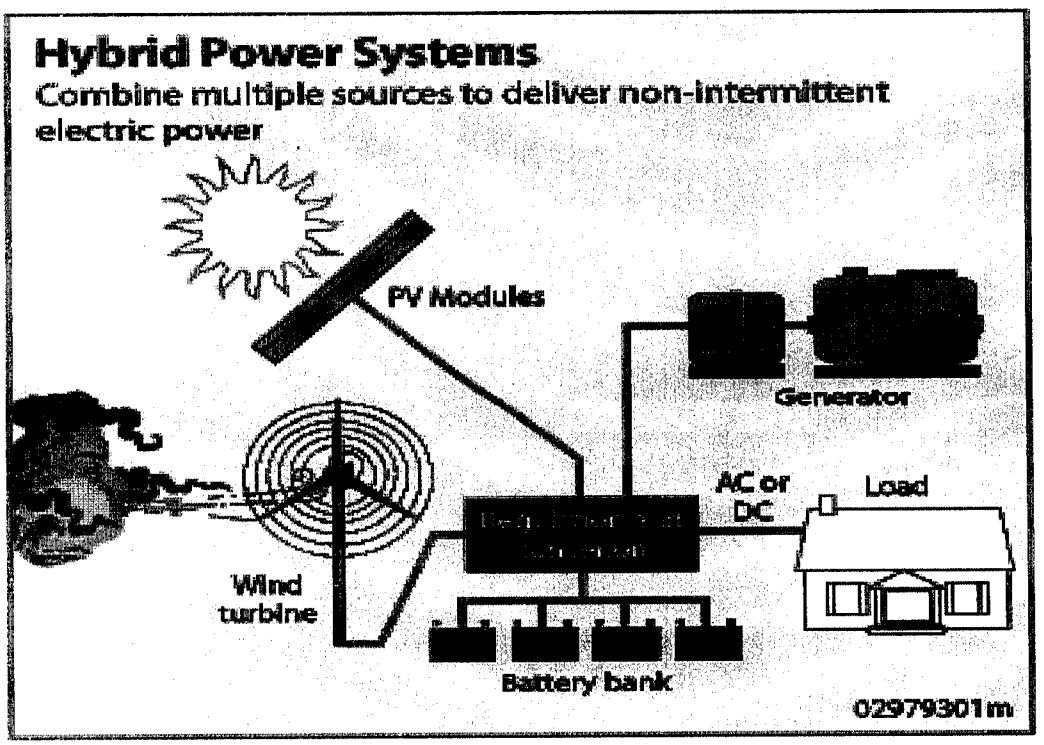
APPENDIX 1

APPENDIX 1

The Hybrid wind Solar Power Generation System

Application of Hybrid Wind Solar Power System





Photovoltaic Cells