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Economic Analysis of a Micro Grid Power Generation

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Abstract: ***Energy plays a vital role in human life. A developed nation was denoted by its per capita consumption of electric energy. India is one of the developing countries in the world. Financial implementation is one of the major problems in a developing country, for energy, food, fuel, communication etc. and the same time the necessity of these things has to be raised according to the increasing population of the country. Due to the economic unbalance, more constraints to implement various emerging trends in power generation. Implementation of Micro Grid with the existing utility grid resolves the increase in power demand. In this paper, it deals with the financial analysis to implement the Micro Grid power generation with the help of Mat lab.***

Index: **Micro grids, Demand, Algoritham, Renewable Energy source.**

I. INTRODUCTION

[1] Micro grid is a proposed model to inter connects the renewable energy sources with the utility grid. The concept was developed during the year of 1970 onwards. But the very long ago we are using the renewable energy sources but the focusing and the necessary is present now only because of the abnormal development of energy consumers and the same time the growth of the fossil fuels are decreasing with respect to our consumption. In Tamilnadu (India) past few years we are affecting the power problem because of the insufficient sources and the generation. The generation is cannot able to meet the demand.

[2] The white paper describes about that the payback period of micro grid implementation and the energy saving methods. It concludes if we implement the grids we can reduce the cost and getting back to the investment with in short durations.

[3] It describes about that the total benefits resulting to consumers and generators equal 114,239.40 €.

INVESTMENT COSTS TO ESTABLISH THE MICRO GRID

LV circuit-breaker	2,000 €
Protection of MV Grid / µG interface	10,000 €
Flywheel based storage system	12,500 €
Load Controllers	13,200 €
Micro generators Controllers	7,800 €
MGCC	15,000 €
Communication System	17,200 €

[4] It defines about the financial strategies and the implementation techniques with Message Passing Algorithms. [5] The analyses indicate that renewable alternatives are not economically feasible at this point of time for decentralized power generation without incentives from the state and federal government. The initial tax credit is not sufficient to offset the lifetime cost incurred, and incentives need to be provided annually for the use of these options to offset the cost and make these options feasible.

II. WHY TO IMPLEMENT MICRO GRIDS?

In Tamilnadu the past ten years to still the deficit of electric energy was raised, to developed the enormous development of energy utilizes. But the same time the UN availability of fossil fuels the ratio of deficit was raised. Number of Consumers at present (The year of 2011) in TNEB

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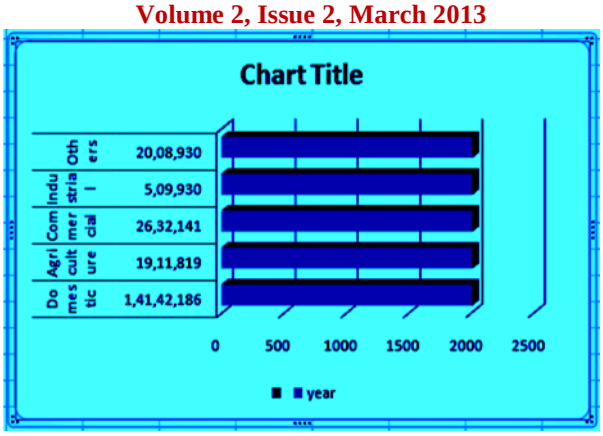

Fig 1 Consumer Growth

From this analysis has shown in number of consumer details during the year of 2005- 2010. Now days it will increase.

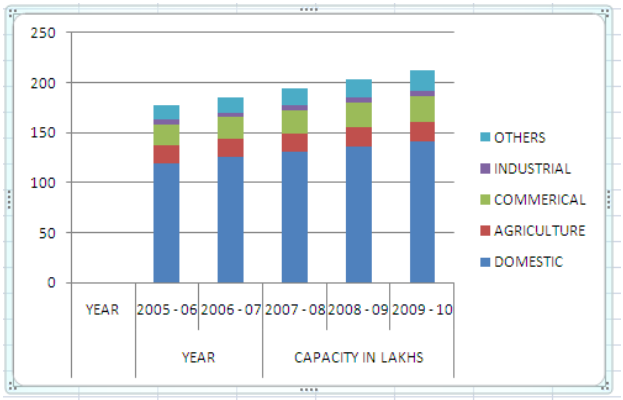

Fig 2 Cumulative Growth of the consumers

From this statistics analysis, the total cumulative number of consumers is growing at about 20 % of every five years if these trends continue at 2015 the total number of consumers will be increase to 2, 56, 000.

III. ENERGY DEMAND ANALYSIS

From the chart shows the average generation of power, demand and the deficit of electric energy during the month of Jan 2011 to May 2011 during the Peak hours (18 hrs to 22 hrs). And the energy deficit was varied from 1500 MW to 3400 MW.

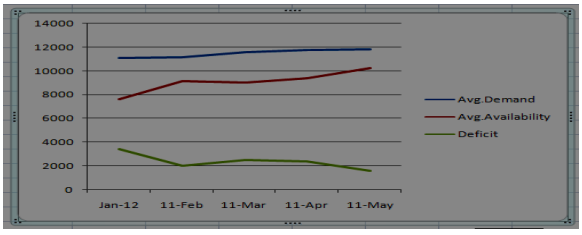

Fig 3 Deficit curve

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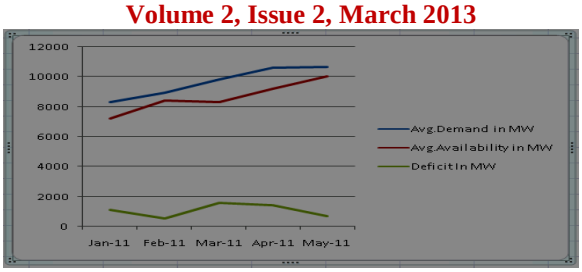

Fig 4 Deficit analysis

From the above figure shows about the energy deficit during the peak hours (22 hrs to 6 hrs) and it shows the average deficit of energy was 500 MW to 1500 MW.

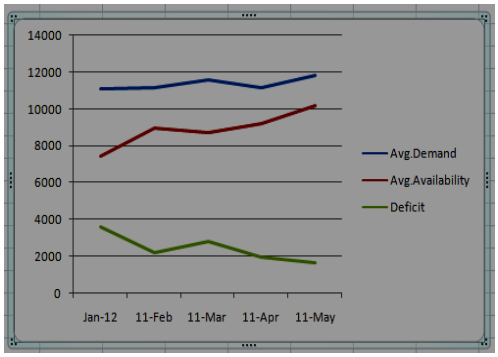

Fig 5

To implement the micro grid we must to know the overall generating cost and the payback period. In this article is present the overall cost determination of Micro Grid Power Plant Implementation with the help of MAT LAB. Let us assume to supply a load having maximum demand of 120 MW with load factor of 25 % by any of the following schemes (a) wind power generation (b) hydro station (c) Bio mass Power Generation in conjunction with hydro station- the latter station supplying $90*10^6$ units per year with maximum output of 35MW (d) Bio mass station. The following data may be assumed. Ignoring the spare capacity required to find out the overall cost per KWh in the case of each scheme.

SNO	STATION	WIND POWER	HYDRO	BIO MASS
1	Capital cost per KW installed (Rs)	700	1600	2200
2	Interest and depreciation (%)	10	8	8
3	Operating cost per KWh (paise)	6	1.5	3
4	Transmission and distribution cost per KWh (paise)	Negligible	0.25	Negligible

IV. MODEL CALCULATION

(a) WIND POWER

Since the spare capacity is to be ignored, the installed capacity will be taken equal to maximum demand.

Annual fixed cost = $0.1*120*10^3*700$

=Rs. $8.4*10^6$

Total energy generated per year $=120*10^3*0.25*8760$

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$=262.8*10^6$ KWh

Running cost $= 22.8*10^6*0.06$

$=$Rs. $15.768*10^6$

Operating cost per unit $= ((24.168*10^6)/(262.8*10^6))*100$

$=9.196$ paise

Total cost $=$ Rs. $(8.4 + 15.768)*10^6$

$=$Rs.$24.168*10^6$

(b) **HYDRO POWER GENERATION**:

Annual Fixed cost$=0.08*120*10^8$81600

$=$ Rs. $15.360*10^6$

Running cost$= 262.8*10^6*(1.5+0.25)/100$

$=2.628*1.75*10^6$

$=$Rs.$4.599*10^6$

Operating cost per unit

$= ((15.360+4.599)*10^6)/(262.8*10^6))*100$

$=7.597$ paise

Total cost = Rs $(15.360+4.599)*10^6$

$= 19.95910^6$

(c) BIO MASS POWER GENERATION:

Annual Fixed cost $=0.08*120*10^3*2200$

$=$ Rs.$21.12*10^6$

Running cost$= (0.03*262.8*10^6)$

$=$Rs.$7.884*10^6$

Operating Cost per unit $= (29.004*10^6*100)/(262.8*10^6)$

$=10.04$ paise

Total cost per year$= 21.12*10^6+7.884*10^6$

$=$ Rs. $29.004*10^6$

ALGORITHM:

[6] Step1: Open a new M-FILE in MATLAB.
Step 2: Input the values of maximum demand, load factor, installed capacity, capital cost, interest and depreciation (%), operating cost and transmission and distribution costs for Wind, Hydro and Bio mass power generating stations.
Step 3: Calculate the annual fixed cost for each station using the formula,
Afc = (I/100)*ic*cc
Step 4: Calculate the total energy generated per year using the formula,
TGE= md*lf*24*365
Step 5: Calculate the running cost for each station as Rc =TGE*oc/100
Step 6: Calculate the total cost for each station as
TC=AFC+RC
Step 7: Calculate the overall cost per unit in paise as
OCV= (TC/TGE)*100

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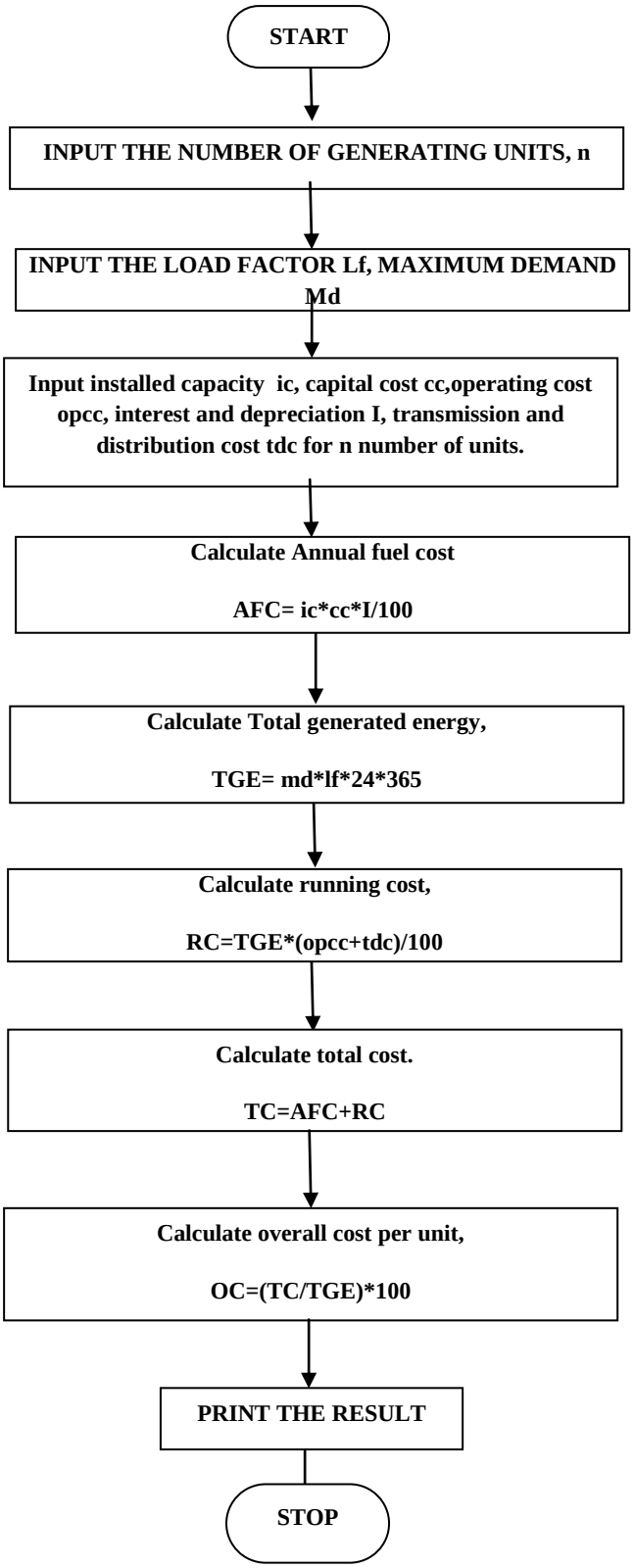
Step 8: Print the result.

V. FLOW CHART



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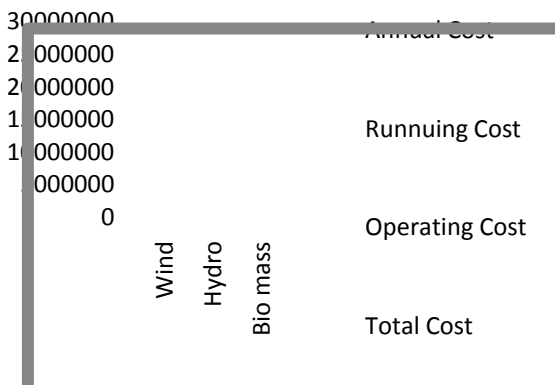
VI. RESULT

Number of generating units 3
1. Wind
2. Hydro
3. Bio mass
Load factor 0.25
Enter the type of unit 1
Maximum demand 120000
Installed capacity120000
Capital cost700
Interest and depreciation in %0.1
Operating cost0.06
AFC=8400000
TGE=262800000
RC=15768000
TC=24168000
OC=9.196
Enter the type of unit 2
Maximum demand120000
Installed capacity120000
Capital cost1600
Interest and depreciation in %0.08
Operating cost1.5
Transmission and distribution cost0.25
AFC=15360000
TGE=262800000
RC=4599000
TC=19959000
OC=7.597
Enter the type of unit 3
Maximum demand120000
Installed capacity120000
Capital cost2200
Interest and depreciation in %0.08
Operating cost0.03
AFC=21120000
TGE=262800000
RC=7884000
TC=29004000
OC=10.04



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VII. CONCLUSION

Micro grid is play as a major role in the energy sector. India is one of the developing countries in the world. And we adopt the micro grids, the raising of micro grids we need to study the financial planning to implement the micro grids. In this article is focused it and give the suitable solution for the financial planning.

REFERENCES

[1] M VIVEK G RAJKUMAR "Green Energy"Int Research journal of Engineering and Technology INDIA 2011.

[2] Robert Liam Dohn" The business case for Micro grids" SIEMENS 2011.

[3] Paulo Moisés Costa , Manuel A. Matos, Member, IEEE" Economic Analysis of Micro grids Including Reliability Aspects 9th International Conference on Probabilistic Methods Applied to Power Systems KTH, Stockholm, Sweden – June 11-15, 2006.

[4] Ying Hu, Anthony Kuh, Alek Kavcic" Modeling and Estimation of Micro grid Parameters Using Message Passing Algorithms7th Annual CMU Conference on the Electricity Industry March 9, 2011.

[5] Kiran Rangarajan, Joe Guggenberger" Cost Analysis of Renewable Energy-Based Micro grids for Rural Energy Management" Industrial Engineering Research Conference.

[6] David Houcque "Introduction to mat lab for engineering students" Northwestern University version 1.2, August 2005

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