International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8, Issue-1, May 2019

Investigation on Feasibility Analysis of Roof - top Solar Power Plant with reference to VFSTR Deemed to be University.

Phani kumar. Katuri

Abstract: ***Scope of roof top solar power plant is increasing day-by- day. Roof top solar power plant when compared with grounded solar power plant is more efficient. As the altitude increases temperatures also increases so that the efficiency of power plant also increases. Norway is the first and foremost country which made a roof top solar plant mandatory irrespective of its size and population. India could be a power abundant country if it could manage to install a solar plant on each of its house with its larger area and population. Vignan's Foundation for Science Technology and Research is having an abundant space over its roof which has been better utilized with a roof top solar power plant which is providing a supportive hand for the management in reducing their increasing power bills. The feasibility of this 1.25MwH is provided in the conclusion.***

Keywords: Roof-top, Feasibility, Sensitivity Analysis, Thermal Power project, Debt service coverage Ratio.

I. INTRODUCTION

Vignan Foundation for Science, Technology and Research University (VFSTR) is an instructive foundation has the mission of to get ready comprehensively adequate instructive administrations needs to give to understudies in the territory of Andhra Pradesh people groups. Vignan Foundation for Science, Technology and Research has 41 long stretches of representative experience on instructive areas. The Vignan Foundation for Science, Technology and Research is situated at vadlamudi, Guntur region. In this cutting edge age the main thing that issues is the means by which successful you are in using anything that you forces. Rooftop top sun powered power plant remains in a sensibly decent position over the successful usage of sun based vitality and space accessible over the rooftop. It is greatly improved to set-up a rooftop top sun oriented power plant with the guide of government so you could be producing your own particular power. With the restricted power sources like warm and hydro power we can move no far. For tremendous foundations it's smarter to introduce a rooftop top sun based power plant to dispose of taking off power bills. Inside the squares accessible, there is a copious space on rooftop top at vignan's university, vadlamudi. Anyway over these years there are kept sit still. A thought rouses to set up the sunlight based power plant which could give a help to hold up under the power bills. With this sort of expansive organizations it is attainability to set up a rooftop top sun powered power plant. Close by there is an endowment accessible from the legislature with the goal that it would not be a weight for administration. Despite the fact that, it is our obligation to check the benefit of the undertaking. Explained subtle elements are talked about underneath.

Assumptions

1. The efficiency of the plant is assumed to be same up to 12 years.However it starts diminishing at10% a couple of years.
2. Operational and maintenance charges at 3.30L from the begging of 6th year.
3. Selling price is assumed to be Rs.6.4 per unit up to 20Years.

Future scope of solar power plant

Sun based power plant has the brilliant future in India on the grounds that the power age in India is enduring issues till now as of late Indian government accomplished the objective to supply capacity to the country territories in India for the future reason the power age get the issues by utilizing the conventional strategies to determine this issues another power age innovation has begun that innovation is sun powered power plant. The sun powered power plant innovation was started in India in the year 2009 in Punjab state limit is 5MW. After the sun oriented power plants are begun in Gujarat, Tamilnadu states and it now every one of the state is support to introduce the sun powered power plants in India.

Need for Installing the Roof top solar power plant in Vignan University

The vignan University is paying the thermo electrical charges to the government of Andhra Pradesh is very high the amount paying to the Andhra Pradesh government Rs. 3,312,796.00per month. Annually the organization paying nearly Rs.39, 753,552.00. so it is very high amount to the VFSTR to reduce this cost VFSTR installed a roof top solar power plant in the VFSTR University. For the reduction of thermal power plant cost roof top solar power plant was installed the total cost incurred to install roof top solar power plant in VFSTR is Rs.6.60cr.

Revised Manuscript Received on 30 May 2019.
***** Correspondence Author
Dr. Phani kumar. Katuri, Asst. Professor, Department of Management Studies, Vignan University, Vadlamudi, Guntur(Dist) – 522 213, Andhra Pradesh, India. (E-mail: katuri.phanikumar@gmail.com) C.no:- 09908973877

To do some analysis installing the Roof top solar power plant in VFSTR is feasible to VFSTR or not has to be verifying by observing the profitability analysis and NPV analysis.

II. RESEARCH TOOLS:

Cost-Benefit Analysis:

A cost-benefit analysis is a process businesses use to analyze decisions. The business or analyst sums the benefits of a situation or action and then subtracts the costs associated with taking that action.

Net Present Value (NPV):

Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project.

$PV= CF/ (1+r)^n$

Internal Rate of Return (IRR):

The Internal Rate of Return (IRR) is the discount rate that makes the net present value (NPV) of a project zero. In other words, it is the expected compound annual rate of return that will be earned on a project or investment.

$NPV= CF/ (1+IRR)^n = 0$

Debt-Service Coverage Ratio:

The debt-service coverage ratio (DSCR) is a measurement of the cash flow available to pay current debt obligations. The ratio states net operating income as a multiple of debt obligations due within one year, including interest, principal, sinking-fund and lease payments.

DSCR = Interest Payment on Debt/ Net Operating Income

Sensitivity Analysis: Sensitivity Analysis measure proportion of change in one variable due to proportion of change in another variable.

Financing of the project

The evaluated cost of the undertaking was Rs. 6.60 crores. Out of this aggregate sum half appropriation was given by focal government it implies 3.30 crores. This undertaking accomplished the money related conclusion on March, 2017. The undertaking was supported by an obligation value proportion of 70:30. The term credit segment was Rs. 2.31 crores and the value segment was Rs.0.99 crores. The aggregate value capital was given by the Vignan establishment through VFSTR University. The point by point capital structure is clarified table 1.1.

Table 1.1 Capital structure of the Roof-top solar Power plant.

Particulars	Amount in Rs.crores	Capital structure in %
Debt Component	2.31	70%
Equity component	0.99	30%
Total	3.30	100%

Source: VFSTRU annual reports, year-2017.

UCO Bank gave the term advance office to VFSTR University in the time of 2017 at 12.9% loan cost. The advance residency was 12 years, including a development time of a half year. The value financing for the venture was principally through the Vignan establishment. In March, 2017,Vignan raised further obligation of measure of Rs.2.31 crores from UCO bank through securitization of gathering resources of Vignan establishment. These assets were raised at an expense of 11%, which is 2.4% more prominent than the expense of general obligation instruments.

Cost of the Project

The project cost was estimated to be Rs. 6.60 crore, but the actual cost of the project was 3.30 crores. The detailed break-up of the project cost is provided in Table 1.2.

Table 1.2 Cost classifications of Roof-top solar Power plant.

Particulars	Total Rs. Crore
Land	0.0
EPC Contract	5.17
Preoperative Expenses	0.73
Other Financing Expenses	0.70
Actual cost	**6.60**

Source: Vignan University Annual reports, year-2017.

The real task cost was in the long run Rs.6.60 crores. The cost gauge for works and supervision of the chose alternative depends on the point by point plan of the undertaking. For this undertaking there is no compelling reason to via arrive. The cost gauge depended on steady costs for the multi year. In this aggregate cost Rs. 0.00crores spend for arrive buy, Rs. 5.17 crores spend on EPC contract of the task, Rs.0.73 crores spend for preoperative costs and Rs.0.70 crores spend for another financing of the venture. This anticipated aggregate qualified expense barring possibilities was Rs.6.60 crores. Out of this qualified cost this sun oriented power venture gets the obligation concede of Rs.2.31 crores by the money related organization at the rate of 11% loan fee. It is precisely 70 % of aggregate qualified expense.

III. REVENUE FROM THE PROJECT

Power pitching to APCPDCL (Central Power Distribution Company of AP Limited) is the main wellspring of incomes of the undertaking. In any case, is rooftop top task is nit pitching capacity to APCPDCL. The produced sunlight based power is utilized to supplant the warm power utilization of the college. Entirely Revenue is gathered from APCPDCL (Central Power Distribution Company of AP Limited). For the count of possibility consider we accept the Power offering cost of per unit cost is 6.49 Rs/Unit.

IV. FINANCIAL AND ECONOMIC ANALYSIS

This project started the operations in the year of 2018.The analysis is performed using a 20-year estimated period of Vignan roof-top solar power project which is from 2018 to 2037. The financial and economic analysis has been to use constant prices. A real discount rate of 4.6 % is used in the financial calculations, while a 5.0 % social discount rate is used in the economic analysis, in line with the financial institution-wide benchmark set by the Reserve Bank of India.

Table 1.3 Profitability Analysis of roof top solar power plant

Years	Net Revenue	Less: O&M and other expenses	PBDIT	Less: Depreciation	Less: Interest on Debt	PBT	Less: Tax	PAT
2018	9600000	0	9600000	4620000	3220000	1760000	272800	1487200
2019	9600000	0	9600000	4620000	3220000	1760000	272800	1487200
2020	9600000	0	9600000	4620000	3220000	1760000	272800	1487200
2021	9600000	0	9600000	4620000	3220000	1760000	272800	1487200
2022	9600000	0	9600000	4620000	3220000	1760000	272800	1487200
2023	9600000	330000	9270000	4620000	3220000	1430000	221650	1208350
2024	9600000	330000	9270000	4620000	3220000	1430000	221650	1208350
2025	9600000	330000	9270000	4620000	3220000	1430000	221650	1208350
2026	9600000	330000	9270000	4620000	3220000	1430000	221650	1208350
2027	9600000	330000	9270000	4620000	3220000	1430000	221650	1208350
2028	9600000	330000	9270000	4620000	3220000	1430000	221650	1208350
2029	9600000	330000	9270000	4620000	3220000	1430000	221650	1208350
2030	7680000	330000	7350000	1980000	3220000	2150000	333250	1816750
2031	7680000	330000	7350000	1980000	3220000	2150000	333250	1816750
2032	6144000	330000	5814000	1980000	0	3834000	594270	3239730
2033	6144000	330000	5814000	1980000	0	3834000	594270	3239730
2034	4608000	330000	4278000	1980000	0	2298000	356190	1941810
2035	4608000	330000	4278000	1980000	0	2298000	356190	1941810
2036	3840000	330000	3510000	1980000	0	1530000	237150	1292850
2037	3840000	330000	3510000	1980000	0	1530000	237150	1292850
					Total	38434000	5957270	32476730

Source: Vignan University reports, year-2017.

The above table shows the profitability of Roof top solar power plant in VFSTR University the revenues are generating from the solar power plant is the total capacity of the power plant is 1.25MW the 1.25MW of electricity is sold to outside the VFSTR at Rs.6.9 per unit and that the efficiency means output generation is reduced after 12years with the specific percent of 10% decrease so the revenue generation is constant up to 12years and the revenues are reducing 10% every 2 years. The operational and maintained cost are free because of the negotiations made by the installers up to 5years after that the maintained cost is 0.5% of the total cost. The depreciation on the Roof top power plant is calculated a new method that is based on the efficiency the depreciation is charged first 12years the depreciation is 7% of the total cost of the project and the next 8years the depreciation is 3% of total cost of the project. The Interest of the debt is 11% is charged the debt is repaid 15years of time with interest and principle. The tax rate is 15.5% after implementing GST.

Table1.4 Calculation of cost of capital and IRR of Roof top solar power point

Years	Net Revenue	PAT	IRR	Less: Interest on Debt
2018	9600000	1487200	9.45%	3220000
2019	9600000	1487200		3220000
2020	9600000	1487200		3220000
2021	9600000	1487200		3220000
2022	9600000	1487200		3220000
2023	9600000	1208350		3220000
2024	9600000	1208350		3220000
2025	9600000	1208350		3220000
2026	9600000	1208350		3220000
2027	9600000	1208350		3220000
2028	9600000	1208350		3220000
2029	9600000	1208350		3220000
2030	7680000	1816750		3220000
2031	7680000	1816750		3220000
2032	6144000	3239730		0
2033	6144000	3239730		0
2034	4608000	1941810		0
2035	4608000	1941810		0
2036	3840000	1292850		0
2037	3840000	1292850		0

Source: Vignan University reports, year-2017.

Table 1.4 demonstrates the IRR and cost of capital estimations of the undertaking, it depends on the anticipated money streams created from the real influence offering and after that it is contrasted and the aggregate venture of the task. Advance the IRR is contrasted with the expense of capital with measure the money related appeal of the undertaking. Amid the investigation time frame Vignan rooftop top has the IRR of 9.45% at the expense of capital 11%, which demonstrates the non-attainability position of the sun based power venture. It is likewise seen that the vignan rooftop top sun based power venture has the surprising expense of capital of 11%, because of the financing cost of 11% and changing the devaluation rate.

Table 1.5 Calculation of Debt Service Coverage ratio of Roof-top solar power plant

Years	PBDIT	Less: Interest on Debt	DSCR
2018	9600000	3220000	2.98136646
2019	9600000	3220000	2.98136646
2020	9600000	3220000	2.98136646
2021	9600000	3220000	2.98136646
2022	9600000	3220000	2.98136646
2023	9270000	3220000	2.878881988
2024	9270000	3220000	2.878881988
2025	9270000	3220000	2.878881988
2026	9270000	3220000	2.878881988
2027	9270000	3220000	2.878881988
2028	9270000	3220000	2.878881988
2029	9270000	3220000	2.878881988
2030	7350000	3220000	2.282608696
2031	7350000	3220000	2.282608696
2032	5814000	0	
2033	5814000	0	
2034	4278000	0	
2035	4278000	0	
2036	3510000	0	
2037	3510000	0	

Source: Vignan University reports, year-2017.

Table 1.5 demonstrates the obligation adjusting and obligation installment capacity of the task. It alludes to the measure of income accessible to meet yearly intrigue and important installments on obligation, including sinking reserve installments. This proportion ought to in a perfect world be more than 1. That would mean this undertaking is creating enough pay to pay its obligation commitments. On the off chance that DSCR is less than 1 then it would mean a negative income. All in all, DSCR = Net Operating Income/Total Debt reimbursement. The table 1.5 demonstrates that the vignan's rooftop top sunlight based power venture DSCR is more noteworthy than one (>1) amid the whole examination time frame and it is differed between 2.98 (2018) and 2.28 (2031). At long last, it demonstrates the normal DSCR of vignan sun based power plant is 2.45 amid 2018 to 2031.

Table 1.6 Calculation of Sensitivity Analysis of Roof-top solar power Plant.

Particulars	(Actual or existing)	Option-1 (5% Decrease in Debt & 5% Increase in equity)	Option-2 (10% Decrease in Debt & 10% Increase in equity)	Option-3 (5% Increase in Debt & 5% Decrease in equity)	Option-4 (10% Increase in Debt & 10% Decrease in equity)
Debt capital in %	70%	65%	60%	75%	80%
Equity capital in %	30%	35%	40%	35%	20%
Total	100%	100%	100%	100%	100%
Debt Amount in Crores	2.31	2.145	1.98	2.475	2.64
Equity Amount in Crores	0.99	1.155	1.32	0.825	0.66
Total	3.30	3.30	3.30	3.30	3.30
Project IRR in %	9.45%	9.653538%	9.838371	9.257158	9.044293
Avg.DSCR	2.45	2.51	2.59	2.29	2.08

Source: Vignan University reports, year-2017.

Table 1.6 clarifies the affectability examination of the task towards proportionate of progress occurred in the current capital structure. Existing capital structure of the task clarified in 'Real' after it is contrasted and the rest of the choices considering the unit change in capital structure. It has been seen that the obligation value proportion of 2.33:1(i.e. 70% of obligation and 30% value) and the Vignan's rooftop top sun powered power venture IRR is 9.45%. This investigation additionally demonstrates that the obligation capital is diminished by 10% (i.e. 60% obligation and 40% of value) and the task IRR is expanded to 9.84% from 9.45%.

V. CONCLUSION

It is also observed that the debt equity ratio is decreased to 1.85:1(i.e. 65% debt and 35% equity) the project IRR is increased to 9.65%.The vignan's roof top solar power project IRR is 9.45% due to high debt equity ratio of 2.33:1 In order to increase the IRR it is recommended to decrease the debt equity ratio to 1:1(i.e. 50% debt and 50% equity).Solar power project output degrades after its 10 to 12 years of operations. Hence, it is suggested that the vignan should try to repay the debt within the 12 years of its operations.

REFERENCES:

1. Babusiaux, D., and Pierru, A. (2001). "Capital budgting, venture valuation and financing blend: methodological proposition." Eur. J. Oper. Res., 135(2), 326– 337.
2. Bakatjan, S., Arikan, M., and Tiong, R. L. K. (2003). "Ideal capital structure demonstrate for BOT control extends in Turkey." J. Constr. Eng. Oversee., 129(1), 89– 97.
3. Blank, F., Baidya, T. K. N., and Dias, M. A. G. (2009). "Private framework speculation through open private association: An application to a toll street interstate concession in Brazil." (Jun. 19, 2009).
4. Brandao, L. E. T., and Saraiva, E. C. G. (2007). "Esteeming government ensures in toll street ventures." (Mar. 8, 2007).
5. Brealey, Richard An., and Myers, Stewart C. (2007). Standards of corporate back, McGraw-Hill, New York. Chandra, P. (2006). Activities: Planning, examination, choice, financing, execution and survey, Tata McGraw-Hill, New Delhi, India.