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Strategic Use of Green Energy for Sustainable Development: A Study of Cost Effectiveness of Solar Energy in Public Organisations

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ABSTRACT

Solar energy has been used in Indian organizations at a very slow pace. Then government of India has decided to aid consumers choosing to invest in solar in hopes of supporting "green energy" movement. Solar energy is clean and free of emission which is great for the environment. We have to select a size of a solar system in and optimum way to reduce the recurring cost of energy. In this paper we present a case study for implementing solar energy sources in order to meet an energy demand at C.C.S. University, Meerut with lowest cost. It would be beneficial to switch over to renewable energy source like solar, wind, tide and biomass. This study basically focuses on making use of solar energy as alternative source of energy. The objectives of the study are the consumption pattern of electric energy in C. C. S. University, Meerut; to study the effect of the use of solar energy in C. C. S. University, on cost of energy consumed and to study other benefits of solar energy at C. C. S. University campus, Meerut. The field of study is focused at C.C.S. University campus, Meerut and generalized findings and suggestion have been given based on the secondary data. The problem is formulated as to minimize the recurring annual expenditure of electric energy at C.C.S. University campus by use of solar energy.

1. INTRODUCTION

Solar energy has experienced tremendous growth in recent years due to technological advances and government policies that support energy development and renewable energy. Solar energy is becoming more economically attractive as technologies improve and the cost of electricity generated by fossil fuels rises. Solar energy has seen a global increase in consumption as more countries recognize the harmful effects of burning fossil fuels. Increased competition within the solar power industry has resulted in sharp declines in installation costs. Today, the price per watt Photovoltaic cell has decreased to Rs. 40. As a result, the number of photovoltaic systems installed in U. S. has drastically increased among residential and commercial spaces. Coal is the most popular fuel source for electricity in countries such as India and China. The availability of bulk local coal and the high price of imported natural gas and oil make coal-fired power more economically attractive. The main emissions from fossil fuels and coalite are CO2, NOx, SOx, and airborne particles such as fly ash, carbonaceous material (soot), suspended particle matter (SPM), and other species. of consecutive gases. Hydroelectric power plants, using about 70% of the total coal in India4 (Garg et. Al., 2002), are among the major Sources (LPS) which have the greatest impact (47% each in CO2 and SO2) on total LPS emissions in India.

Rapid use of fossil fuel resources has initiated the need of search for alternate energy sources to meet out the increasing demand of energy. In India there are remote areas which are isolated by its difficult geographic situations and it was not possible to lay down the electric circuits in those terrains solar energy was only solution to serve these types of difficult areas to remove power crisis. The capacity of renewable energy sources is increasing day by day due to

the support of government policies.

Solar energy is derived from the Sun through the form of solar radiation. Solar Powered electric generation relies on photovoltaic cells. The photovoltaic system consists of solar modules, a panel, rechargeable batteries, a load or device and the associated electrical connections. The cells absorb sunlight and convert the solar energy into electrical energy which is then passes to the control unit. Electrical energy produced is direct current (D C) on inverter is occasionally needed to convert the electricity to AC (Alternately current). The main advantage of solar system is it has no moving part, So Photovoltaic system is essentially pollution free.

2. SOLAR POWER IN INDIA

Solar power in India is a fast-developing industry the country's solar installed capacity was 35,739MW as of 31 August 2020. The Indian government had and initial target of 20GW capacity of 2022 which was achieved four years ahead of schedule. In 2015the target was raised to 100GW of solar capacity (Including 40GW from rooftop solar) by 2022 targeting and investment of US $100 billion. India has established nearly 42 solar parks to make lend available to the promoters of solar plant. Rooftop solar power accounts for 2.1GW of which 70% is industrial or commercial. In addition to it's large scale grid connected solar photovoltaic (PV) initiative, India is developing off –grid solar power for local energy needs.

The international solar Alliance (ISA) proposed by India as a founder member is head quartered in India has also put forward the concept of ‘One sun one world one grid’ and ‘world solar bank’ to harness abundant solar power on global scale.

3. REVIEW OF LITERATURE

Swami Prakash Srivastava, Surat Prakash Srivastava (2013) drawn three major conclusions: a) India's solar market could be worth billions of dollars over the next decade;

b) India's solar potential is real enough, and the support environment is improving fast enough, to forecast a $6 billion to $7 billion capital-equipment market and close to $4 billion in annual revenues for grid-connected solar generators over the next decade. c) Project execution, financing, and localization are crucial.

R. Sophia Porchelvi, K. Sathya (2015) studied and presented here in this paper the availability and utilization of renewable energy sources and also the sources of power supply in India. Power consumption of Nagapattinam district has been surveyed and few suggestions have been made. The purpose of this work aims at showing the application of integrated energy sources will be cost benefit as well as fulfil the energy needs without any interruption.

Prasanna M. G. et al. (2015) suggested that Total investment: 96 lakhs for 100kw roof top solar PV power plant with battery backup, 88 lakhs for without battery backup. The acceptable NPV cost with and without battery is 0.06 and 0.01 crore respectively with the interest rate of 13%. The acceptable IRR with and without battery is 10.59% and 14.98% respectively with the interest rate of 13%. The preferable LCOE with and without battery is 5.3 and 5.0 with the interest rate of 13%.

Elvin B. et al. (2016) suggested Current retail energy prices in the US and the record low cost of solar PV power have made it so that PV power is a realistic option for many commercial building owners even without large subsidies or feed in tariffs. This information suggests that the most pressing matter to commercial solar investors is the large start up costs associated with these investments, and that an extension of the ITC and deregulation of PPA contracts may prove helpful with this issue. However, in states with low retail electricity prices, feed in tariffs may be necessary to further promote investment in solar energy nationwide. Studies that should be considered to expound upon our findings include: analyses of investors' prioritization of start up costs vs. total cost over the life of a PV system, the potential negative effects of deregulating PPA contracts, and what specific areas in the US would most benefit from a feed in tariff based on retail energy prices.

Shabrin N. et al. (2017) report is discussing about social and economic benefit of green building. The findings of this study are similar to those in other countries, in most of which the excess cost of the green building was estimated at 0–10%. The high rate of return on

investment, stems mostly from savings on electricity (about 40% of the entrepreneur's benefits) and increased worker productivity (about 60% of the entrepreneur's benefits); even when ignoring the latter, and limiting the analysis to the physical aspects of the building, green building is still economic (Hadas et al., 2014). As a return on investment is expected within a short time (few years), the promotion of the private green building market and the public sector must revolve around educating the market, training professionals and developing financial solutions. Furthermore, given the right financial solutions, it is possible to enforce the Green Building Standard by law (in the government and the private sector. Finally, it can be said that it is possible to calculate theoretically the relative benefits of green buildings when the direct calculation is not possible due to a limited inventory.

4. OBJECTIVES OF THE STUDY

- The consumption pattern of electric energy in C. C. S. University, Meerut.
- To study the effect of the use of solar energy in C. C. S. University, on cost of energy consumed.
- To study other benefits of solar energy at C. C. S. University campus, Meerut.

5. ENERGY CONSUMPTION AT CCS UNIVERSITY

C.C.S. University has two electrical connection of 700 KW each and total electric load of 1400 KW. Total electrical expenditure along with UPPCL and generator is approximately 5.00 crores annually. As University is in expending phase the electric load is increasing day by day so we have to find out some economic and pollution free solution for C.C.S. University campus.

Decision of Solar energy plan has been taken by University to minimize it's recurring expenditure on electricity We have compiled data for three years (2015-2018) for electrical energy consumption before implantation of solar energy. Then from 2018 year solar plant has been installed and we compiled the electrical energy consumption data from year 2018 to 2020. Total expenditure incurred on electricity during five years at C.C.S. University campus, Meerut (2015-2020) is as given below:

- No. of electric connection- 2 Nos. (700 KW each)
- Total Load-1400 KW
- Solar Plant Load- 1260KW
- Model- RESCO MODE: It is defined in which the entire system is owned by the developer. Rooftop owners consume the electricity generated, for which they must pay a pre-decided tariff monthly. It is a low-cost intensive option as compared to CAPEX model where the entire system is owned by the rooftop owners.

Renewable energy in India has so far been dependent on subsidies given by the Government. But after Paris agreement, since India committed to setting up 175GW of renewable energy till 2022, we have seen the emergence of RESCO Solar model of PV installation. Factors such as frequent power cuts, increasing prices of conventional power, high irradiation and the falling costs of solar are driving the demand in Roof Top Market.

The solar system in C.C.S, University, Meerut has produced 29,93,410.40 Kwh of units, as solar energy is free from carbon dioxide emission it means it saves the carbon dioxide emission into the atmosphere.

6. EFFECT ON CARBON EMISSION

Generation of 1 Kwh of electricity through thermal power or DG sets emits 475 grams of CO2 into the atmosphere, that means

Table 1

Expenditure incurred on electricity during the year 2015-16 (in Rs.)

Sl. No.	Year	Month	Consumption of Electrical connection No – 106151	Consumption of Electrical connection No – 36931	Generator expenditure	Total
1	2015	April	1058778	1353780	319080	2731638
2	2015	May	1160335	1485740	891480	3537555
3	2015	June	1432981	1700967	506070	3640018
4	2015	July	1469095	1531142	658830	3659067
5	2015	August	1359495	1432765	764550	3556810
6	2015	September	1511895	1575790	946170	4033855
7	2015	October	1516034	1495963	914040	3926037
8	2015	November	1271039	1373586	465270	3109895
9	2015	December	1095633	1343353	772500	3211486
10	2016	January	1770011	1633988	292590	3696589
11	2016	February	1898948	1558378	145110	3602436
12	2016	March	1443672	1423303	595230	3462205
		Total	**16987916**	**17908755**	**7270920**	**42167591**

by generating 29,93,410.40 Kwh of units we have saved 1,421.86 ton of CO2 emission.

Table 2
Expenditure incurred on electricity during the year 2016-17 (in Rs.)

Sl. No.	Year	Month	Consumption of Electrical connection No – 106151	Consumption of Electrical connection No – 36931	Generator expenditure	Total
1	2016	April	1144446	1358745	900330	3403521
2	2016	May	1409047	1527312	954000	3890359
3	2016	June	2097638	1628861	1001820	4728319
4	2016	July	1768243	1492680	502920	3763843
5	2016	August	1583081	1405366	637200	3625647
6	2016	September	11459183	1552645	327180	13339008
7	2016	October	1763204	1670593	502230	3936027
8	2016	November	1342524	1396449	336300	3075273
9	2016	December	1523428	1373305	173190	3069923
10	2017	January	1640350	2157883	355350	4153583
11	2017	February	1968537	1701191	179220	3848948
12	2017	March	1357294	1573839	358440	3289573
		Total	**29056975**	**18838869**	**6228180**	**54124024**

Table 3
Expenditure incurred on electricity during the year 2017-18 (in Rs.)

Sl. No.	Year	Month	Consumption of Electrical connection No – 106151 (Rs.)	Consumption of Electrical connection No – 36931(Rs.)	Generator expenditure (Rs.)	Total
1	2017	April	1482577	1722238	344550	3549365
2	2017	May	1633903	1394268	513000	3541171
3	2017	June	2263524	2102707	674010	5040241
4	2017	July	1792403	1838612	501240	4132255
5	2017	August	1640535	1573246	517020	3730801
6	2017	September	1600162	1655472	888300	4143934
7	2017	October	1665263	1604768	702810	3972841
8	2018	November	1283440	1364928	532260	3180628
9	2018	December	1398291	1677203	714930	3790424
10	2018	January	1661766	2071913	372480	4106159
11	2018	February	1620746	2785350	762360	5168456
12	2018	March	1391993	1774072	192600	3358665
		Total	**19434603**	**21564777**	**6715560**	**47714940**

Figure 1 shows the trend of year wise expenditure incurred on electricity. It is showing total expenditure on electricity during year 2015-16 to 2019-20. There is drastic change in expenditure from 2018-19 to 2019-20.

Table 4
Expenditure incurred on electricity during the year 2018-19 (in Rs.)

Sl. No.	Year	Month	Consumption of Electrical connection No – 106151	Consumption of Electrical connection No – 36931	Generator expenditure	Solar expenditure	Total
1	2018	April	1503091	1871085	195600		3569776
2	2018	May	1602766	2096864	398880	311118	4409628
3	2018	June	2066059	2545315	616530		5227904
4	2018	July	1663668	2137479	1220730		5021877
5	2018	August	1295741	1601894	409950		3307585
6	2018	September	175685	1883776	435360	439005	2933826
7	2018	October	1712224	1865170	430470		4007864
8	2018	November	1506698	1626402	422370	155151	3710621
9	2018	December	1904656	1467432	191190	128154	3691432
10	2019	January	3283028	1912975	380940	150972	5727915
11	2019	February	3381950	2083586	432510	250240	6148286
12	2019	March	2801751	1677327	592560	264100	5335738
		Total	**22897317**	**22769305**	**5727090**	**1698740**	**53092452**

Table 5
Total Expenditure incurred on electricity during the year 2015-16 to 2019-20 (in Rs.)

Sl. No.	Month	2015-16	2016-17	2017-18	2018-19	2019-20
1	April	2731638	3403521	3549365	3569776	5165659
2	May	3537555	3890359	3541171	4409628	2601152
3	June	3640018	4728319	5040241	5227904	2574777
4	July	3659067	3763843	4132255	5021877	2319863
5	August	3556810	3625647	3730801	3307585	2124392
6	September	4033855	13339008	4143934	2933826	2891389
7	October	3926037	3936027	3972841	4007864	3010231
8	November	3109895	3075273	3180628	3710621	2442304
9	December	3211486	3069923	3790424	3691432	2497150
10	January	3696589	4153583	4106159	5727915	2422879
11	February	3602436	3848948	5168456	6148286	3108609
12	March	3462205	3289573	3358665	5335738	3025167
	Total Expenditure	**42167591**	**54124024**	**47714940**	**53092452**	**34183572**

As we know we have started using solar power from year 2019-20 the total cost saved between financial years 2018-19 and 2019-20 is Rs. 1.9 Cr. which is very major saving in energy cost as compared to the previous year.

Figure 1
Year wise expenditure incurred on electricity

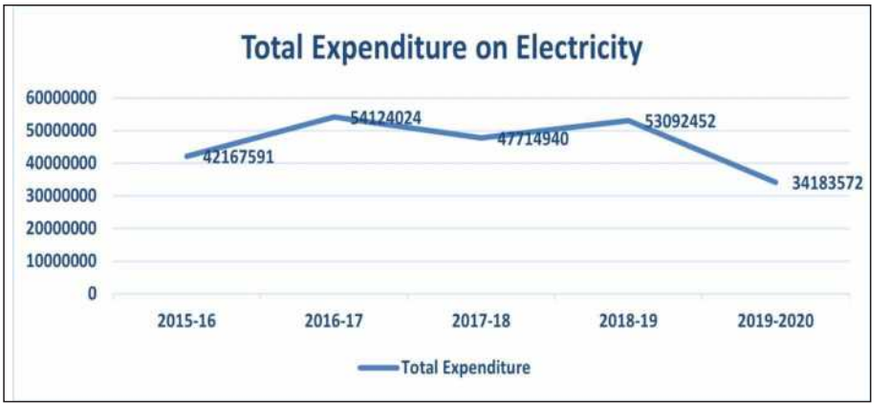


Table 6
Month wise Generation of Solar Energy

S No.	Month	Total Electricity Produced (KWh)	Unit Rate	Amount
1.	July 2018	79570.00	3.91	3,11,118.70
2.	August, September & October 2018	112278.00	3.91	4,39,007.00
3.	November 2018	398680.60	3.91	1,55,151.00
4.	December 2018	32776.00	3.91	1,28,154.00
5.	January 2019	38611.80	3.91	1,50,972.00
6.	February 2019	64000.10	3.91	2,50,240.39
7.	March 2019	67545.00	3.91	2,64,100.00
8.	April 2019	73,931.00	3.91	2,89,070.00
9.	May 2019	124583.00	3.91	4,87,119.00
10.	June 2019	143180.00	3.91	5,59,836.00
11.	July 2019	117016.00	3.91	4,57,532.00
12.	August 2019	123511.00	3.91	4,82,928.00
13.	September 2019	83695.00	3.91	3,27,247.00
14.	October 2019	111492.00	3.91	4,35,933.00
15.	November 2019	115620.00	3.91	4,52,074.00
16.	December 2019	103579.00	3.91	4,04,993.00
17.	January 2020	47030.00	3.91	1,83,887.00
18.	February 2020	74673.00	3.91	2,91,971.00
19.	March 2020	126962.00	3.91	4,96,421.00
20.	April, May & June 2020	210800.00	3.91	8,24,228.00
21.	July & August 2020	254606.00	3.91	9,95,509.00
22.	September 2020	88563.00	3.91	3,46,281.00

Table 7
Consumption Pattern of Diesel Before the Use of Solar Energy

Consumption Pattern of Diesel Before the Use of Solar Energy		Consumption Pattern of Diesel After the Use of Solar Energy	
Month	Consumption in Liters	Month	Consumption in Liters
August 2017	12000	August 2018	6000
September 2017	15000	September 2018	6000
October 2017	12000	October 2018	6000
November 2017	9000	November 2018	6000
December 2017	12000	December 2018	3000
January 2018	12000	January 2019	6000
February 2018	9000	February 2019	6000
March- April 2018	3000	March 2019	9000
May 2018	6000	April 2019	6000
June 2018	9000	May 2019	6000
July 2018	18000	June 2019	3000
		July 2019	6000
Total	**1,17,000**	**Total**	**69,000**

Figure 2
Diesel Consumption in Liters

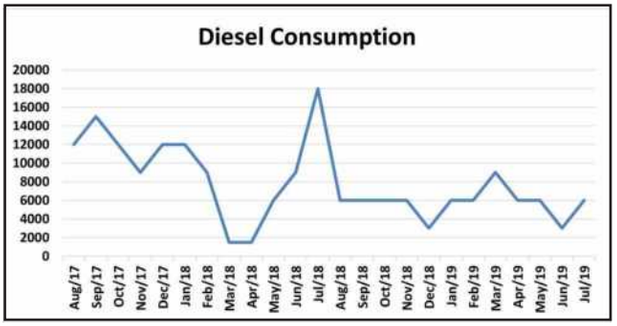
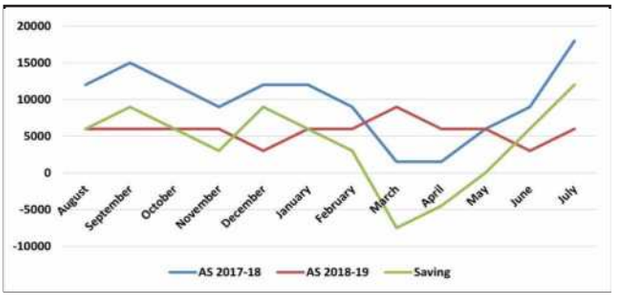


Figure 3
Month Wise Diesel Consumption and Savings through Solar Energy



Green Line in the figure 3 shows clearly the savings of diesel after the implementation of the solar energy in the organization.

Coal is the primary fuel for electricity generation in India and its usage is continuously increasing to meet the energy demands of the country. This paper presents emissions of carbon dioxide (CO2), sulfur dioxide (SO2), and nitric oxide (NO) from thermal power plants in India for a period of nine years from 2001-02 to 2009-10. The emission estimates are based on a

Table 8
Month wise Consumption of Diesel and Saving Through Solar Energy

Diesel Consumption in Liters			
Month	AS 2017-18	AS 2018-19	Saving
August	12000	6000	6000
Septembe	15000	6000	9000
October	12000	6000	6000
Novembe	9000	6000	3000
Decembe	12000	3000	9000
January	12000	6000	6000
February	9000	6000	3000
March	1500	9000	-7500
April	1500	6000	-4500
May	6000	6000	0
June	9000	3000	6000
July	18000	6000	12000
Total	117000	69000	48000

model in which the mass emission factors are theoretically calculated using the basic principles of combustion and operating conditions. Future emission scenarios for the period up to 2020-21 are generated based on the estimates of the nine years from 2001-02 to 2009-10. Power plants in India use different qualities of coal, different combustion technologies and operating conditions. As a result, these plants have differences in achieved efficiencies (coal usage per unit of electricity).

The estimates show region wise differences in total emissions as well as differences in emissions per unit of electricity. Computed estimates show the total CO2 emissions from thermal power plants have increased from 323474.85 Gg for the year 2001-02 to 498655.78 Gg in 2009-10. SO2 emissions increased from 2519.93 Gg in 2001-02 to 3840.44 Gg in 2009-10, while NO emissions increased from 1502.07 Gg to 2314.95 Gg during this period. The emissions per unit of electricity are estimated to be in the range of 0.91 to 0.95 kg/kWh for CO2 , 6.94 to 7.20 g/kWh for SO2 , and 4.22 to 4.38 g/kWh for NO during the period 2001-02 to 2009-10. The future emission scenario, based on the projected coal consumption in Indian thermal power plants by Planning Commission of India under 'Business-as Usual (BAU)' and "Best case Scenario (BCS)' show the emission in the range of 714976 to 914680 Gg CO2, 4734 to 6051 Gg SO2 and 366 to 469 Gg NO in the year 2020-21. Increase in coal use efficiencies in electricity generation by thermal power plants can significantly reduce the emissions of greenhouse and polluting gases. This methodology provides a useful tool for inventory preparation in a sector where measured values for emissions factors are very sparse.

Approximately 40% of global Carbon dioxide (CO2)emissions are emitted from electricity generation through the combustion of fossil fuels to generate heat needed to power steam turbines. Burning these fuels results in the production of Carbon dioxide (CO2), the primary heat trapping, "greenhouse gas" responsible for global warming. Applying smart grid technologies can potentially reduce Carbon dioxide (CO2)emissions. Electric grid comprises three major sectors : generation, transmission and distribution grid and consumption. Smart generation includes the use of renewable energy sources such as wind, solar or tidal energy.

7. CONCLUSION

It is evident from the analysis that using solar energy is cost effective. Saves expenditure on electricity, saves diesel consumption and reduces carbon emission. Major findings of the study are as follows:

a) Total cost saved between financial years 2018-19 and 2019-20 is Rs. 1,9 Cr. which is a very major saving in energy cost as compared to the previous year.

b) Total diesel saved between two consecutive financial years is 48,000 liters.

c) Carbon emission has been controlled by using alternate source of solar energy at Ch. Charan Singh University campus.

d) Green Energy has become alternate source, the use of solar energy will be cost effective and it will also fulfill the future energy demand of the organization. ●

REFERENCES

1. *Archit Jain, Soumya Joshi, PragyaJat (2016), Power, cost- benefit analysis of solar rooftop systems for Delhi households, Delhi citizens handbook 2016.*
2. *Avinash H.N. And PalakTimbadiya(2010), Overview of sustainable renewable energy potential in India.*
3. *Buragohain, T. (2012),Impact of solar energy in rural development in India.*
4. *CentralElectricityRegulatoryCommission (2012), Explanatorymemorandumfor benchmarkcapitalcostnormsforsolarpvpowerprojectsandsolarthermalpower projectsto be applicable for the year 2013-14, Oct2012, pp.7-8.*
5. *Clarke,K.,Sharma,S.,&Vis-Dunbar,D.(2014), Indiaenergysubsidyreview,India Energy SubsidyReview,1(1), 1-24.*
6. *Davide A.G., Fabrizio C., Mariagrazia T., Valentina S.F., Giuseppe P. (2016), Cost-Benefit Analysis for Energy Management in Public Buildings: Four Italian Case Studies, Energies, 9, 522; doi:10.3390/en9070522 2016.*
7. *DecisioBV.(n.d). SocialCost Benefit Analysis, Decision BVAmsterdam, Netherlands, p.1.*

8. *Ea Energy Analysis,Renewable Energy Costs and Benefits for Society (RECABS), A Research Analysis Prepared for the IEA's Implementing Agreement on Renewable Energy Technology Deployment.*
9. *Elvin B., Wu H., Nathan M., Deniz O., Eduardo Z. (2016),CostBenefit Analysis of Photovoltaic Solar Energy Use in an "Average" US Commercial Building 2016.*
10. *Emmanouil M., George P., Vassilis B. (2013), Cost-Benefit Analysis of Renewable Energy Systems Under Uncertainties,National Center for Scientific Research.*
11. *HumanresourcedevelopmentstrategiesforIndianrenewableenergy sector,Final Report,Retrieved fromhttp://mnre.gov.in/file-manager/UserFiles/MNRE_HRD_ Report.pdf*
12. *IndianEnergyExchange(2012), BusinessrulesofIndianenergyexchangelimited, New Delhi, Dec. 2012, p.5.*
13. *InternationalJournal of EnvironmentalScienceand Development, 3(4), 334-338.*
14. *Mcfaul, J.P. Paulina S.R. (2012), Comparative Cost-Benefit Analysis of Renewable Energy Resource Trade Offs for Military Installations, Form Approved OMB No. 0704–0188, Naval Postgraduate School Monterey, CA 93943–5000.*
15. *Prasanna, M.G., Mahammed S., Hemavati G. (2015), Financial analysis of solar photovoltaic power plant in India, IOSR journal of Economics and Finance, e- ISSN : 2321-5933, p- ISSN : 2321-5925.*
16. *MinistryofNewandRenewableEnergy(2010), JawaharlalNehrunationalsolar missiontowardsbuilding solarIndia,Retrievedfrom http://pib.nic.in/archieve/others/GuidelinesJNNSolarMission.pdf, pp.2-10.*
17. *MPA Candidates Evans School (2016),A benefit- cost analysis on Taylor county solar facility in Georgia, vol.6, spring 2016.*
18. *Murthy K.I. (2012), A causal study between electricity consumptionand CO2 emissions inIndia, Prabandhan: Indian Journalof Management,5(7), 43-52.*
19. *Natarajan P &Nalini G.S. (2015), Social cost benefit analysis of solar power projects, "Prabandhan" - Indian journal of management, New Delhi, April 2015.*
20. *Natural Resources DefenseCouncil (2009), From Copenhagen accord to climate action:Tracking nationalcommitmentstocurbglobalwarming,Retrievedfrom http://www.nrdc.org/international/copenhagenaccords/*
21. *NaturalResourcesDefenseCouncil&CouncilonEnergy,EnvironmentandWater. (2015), Clean energy powers local job growth in India, Interim Report,Retrieved from http://www.nrdc.org/international/india/files/india-renewable-energy-jobs-IR. pdf*
22. *Nushrat S., Saad Bin A.K. (2017), A Comprehensive Cost Benefit Analysis of Green Building,International Journal of Advances in Mechanical and Civil Engineering, 4(2).*
23. *Prabhakant&Tiwari,G.N.(2008), Evaluationofcarboncreditsearnedbyasolar energypark in Indianconditions, Fuels&EnergyScience, 1, 57–66.*
24. *R. Sophia Porchelvi& K. Sathya (2015), Cost benefit analysis of installing renewable energy, international journal of scientific and research publications, 5(4).*
25. *Saravanan,M.(2011).Carboncredit-aneco-friendlybusiness, Prabandhan:Indian Journal of Management,4(1), 10-16.*
26. *Sharma,N.K.,Tiwari,P.K.,&Sood,Y.R.(2012), SolarenergyinIndia:Strategies, policies,perspectives andfuture potential,RenewableandSustainable Energy Reviews, 16(1), 933-941.*
27. *Shrimali,G.,&Tirumalachetty,S.(2013), Renewableenergycertificatemarketsin India-areview. Renewable and Sustainable Energy Reviews,26, 702-716.*
28. *Srivastava,S.P.,&Srivastava,S.P.(2013), SolarenergyanditsfutureroleinIndian economy, InternationalJournalof EnvironmentalScience:Developmentand Monitoring, 4(3), 81–88.*
29. *Srivastava S.P. &Srivastava S.P. (2013), Solar energy and its future role in Indian economy,International journal of environmental science, 4(3).*
30. *Tarujyoti B. (2012), Impact of solar energy in rural development in India, International journal of environmental science and development,3(4).*
31. *Vineeth A.V.M. (2014), India`s solar energy future, A report of CSIS Wadhwani chair in U.S. India policies studies.*
32. *World Development Indicators, The World Bank, Retrieved fromhttp://data.worldbank.org/data-catalog/world-development-indicators*