

Study of Cost Analysis and Emission Analysis for Grid Connected PV Systems using RETSCREEN 4

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Abstract— Power is one of the most important factors for a developing country like Bangladesh. Bangladesh is facing a lot of drawbacks to acquire sustainable development owing to lack of electricity. These days the request of control is expanding day by day in Bangladesh. Bangladesh is now to build a solar power project. The most subject of this paper is to discuss around consist of the cost analysis and emission analysis as per given by RET Screen 4 simulations which will give a complete idea of cost of establishing this combination.

Keywords- Renewable energy, Solar Plant, RET screen, PV array, Cost analysis, emission analysis etc.

I.INTRODUCTION

Electricity is a very important factor in developing the economy and the standard of living of a country. It must be generated using the national resource of that country. Renewable energy is energy that is obtained from renewable resources, which are naturally restocked on a human timescale, such as sunlight, wind, rain, tides, waves and geothermal heat. The show renewable vitality arrives from biogas, hydro control, solar and wind. Bangladesh could be a creating nation which offers numerous choices and openings for utilizing renewable vitality sources for producing electric control. Solar energy is one of the renewable energy. Here a study has been made on the cost and performance analysis of solar power plant in the region of Sundargonj, Gaibandha (Division: Rangpur) of Bangladesh using RET Screen software. Beximco Power Co Ltd along with a Chinese company is set to build a 200MWh solar power plant in Gaibandha, in line with the government's plan to generate 10 percent of power from renewable sources by 2020.[1] The choice of the renewable energy is dependent on weather and climatic conditions in an area and their rate of change from time to time.

When a PV system is connected to the local electricity network, any excess power that is generated can be fed back into the electricity grid. Under a FiT regime, the owner of the PV system is paid according the law for the power generated by the local electricity provider.

This type of PV system is referred to as being „on-grid“ [2].

In this paper is to discuss around consist of the cost analysis and emission analysis.

II.METHODOLOGY:

RETScreen: It is a Clean Energy Management Software system for energy efficiency, renewable energy and cogeneration project feasibility analysis as well as ongoing energy performance analysis. It empowers professionals and decision-makers to rapidly identify, assess and optimize the technical and financial viability of potential clean energy projects. This decision intelligence software platform also allows managers to easily measure and verify the actual performance of their facilities and helps find additional energy savings/production opportunities.[3] Each RETScreen vitality innovation demonstrate (e.g., Photovoltaic Venture, etc.) is created inside an individual Microsoft Exceed expectations spreadsheet "Exercise manual" record. The Workbook record is in-turn composed of a arrangement of worksheets. These worksheets have a common see and follow a standard approach for all RETScreen models.



Fig: Retscreen

Solar Energy: A photovoltaic power station, also known as a solar park, solar farm, or solar power plant is a large-scale photovoltaic system designed for the supply of merchant power into the electricity grid.[4] A sun-based power plant is any sort of office that changes over daylight either straightforwardly, like

photovoltaics, or in a roundabout way, like sun oriented warm plants, into power. Source: Heliogen. They come in a assortment of sorts, with each utilizing discretely diverse strategies to saddle the control of the sun.



III. RESULT:
Here is a basic idea about project information through RETscreen software. Figure-1 is meant.

Project information

See project database

Project name

Beximco Power Co. Ltd

Project location

Sundorgang, Gaibanda

Prepared for

POB

Prepared by

Group 6

Project type

Power

Technology

Photovoltaic

Grid type

Central-grid

Analysis type

Method 1

Heating value reference

Higher heating value (HHV)

Show settings

☒

Language - Langue

English - Anglais

User manual

English - Anglais

Currency

Bangladesh

Units

Metric units

Figure-1: Project information

Climate Information:
Need to select weather zone of a place nearest to the place where the analysis is carried out. The RETSCREEN program at that point gives the total climate points of interest of the place closest to put of investigation. The RETscreen program moreover gives data with respect to the day-by-day sun-based radiation(horizontal), heating and cooling days, wind speed, soil temperature etc. As like as Fig-02

Country - region	Bangladesh		
Province / State	n/a		
Climate data location	Rangpur		
Latitude	"N	25.7	
Longitude	"E	89.3	Source
Elevation	m	28	NASA
Heating design temperature	°C	13.0	NASA
Cooling design temperature	°C	30.7	NASA
Earth temperature amplitude	°C	14.6	NASA

	Air temperature	Relative humidity	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days	Cooling degree-days
	°C	%	kWh/m²/d	kPa	m/s	°C	°C-d	°C-d
Jan	17.6	53.5%	4.35	98.9	2.3	19.1	12	236
Feb	20.6	47.6%	5.22	98.7	2.5	23.0	0	298
Mar	24.6	46.8%	6.10	98.3	2.6	27.6	0	453
Apr	25.6	65.9%	6.20	98.1	2.5	27.9	0	469
May	26.2	78.4%	5.74	97.8	2.4	28.0	0	501
Jun	27.0	84.6%	4.77	97.5	2.3	28.1	0	510
Jul	27.0	86.7%	4.19	97.5	2.1	27.8	0	526
Aug	27.0	85.3%	4.29	97.7	2.0	27.8	0	527
Sep	26.0	84.8%	3.89	98.0	1.9	26.7	0	481
Oct	24.0	78.6%	4.67	98.4	1.9	24.4	0	434
Nov	21.0	67.6%	4.66	98.7	2.1	21.1	0	330
Dec	18.6	57.9%	4.26	98.9	2.2	19.2	0	266
Annual	23.8	69.9%	4.86	98.2	2.3	25.1	12	5,032
Source	NASA	NASA	NASA	NASA	NASA	NASA	NASA	NASA

Measured at m 10 0

Figure-2: Climate Information

LOAD AND NETWORK ANALYSIS:
Here the data with respect to the normal net control stac of the building is given by the client depending on the apparatuses utilized, season, climate conditions concurring to which the data is taken, number of individuals within the building, the apparatuses they are utilizing etc. which is bolstered to RETSCREEN. The program moreover inquires of how much load ratio of network and the PV innovation utilized is to be maintained. This will provide us the proposed case stack data characteristics.

Energy Model: Sizing a photovoltaic system is an important task in the system’s design. In the sizing process one has to take into account three basic factors:

- The solar radiation of the site and generally the Metrological data
- The daily power consumption and types of the electric loads.
- The storage system to contribute to the system’s energy independence for a certain period of time

The PV generator is larger than usual it'll have a enormous affect in the last taken a toll and the cost of the control delivered and in the other hand, the PV-generator is undersized, problems might happen in assembly the control request at any time .The amount of sun powered radiation at a location at any time, either it is expressed as sun based escalated (W/m2) or sun based radiation in MJ or Wh, is primarily required to supply reply to the amount of control delivered by the PV generator. The amount of electrical vitality

created by a PV-array depends basically on the radiation at a given area and time. The choice of the number of PV technology depends on user like in figure- 3.

RETScreen

System

Power

Technology

Photovoltaic

Type

mono-Si

Manufacturer

Sunpower

Model

mono-Si - SPR-320E-WHT

Capacity per unit

W

320

Number of units

500

Capacity

W

160,000

Efficiency: 19.62 %

Frame area: 1.62 m²

✓

✗

🌐

📄

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Figure-03: PV panel choice in RETSCREEN

This the values of the other field as per convenience of the user is given that gives the following proposed case power system in RETSCREEN 4 as is given in figure-4

Proposed case power system

Technology

Photovoltaic

Analysis type

⊙ Method 1

○ Method 2

Photovoltaic

Power capacity

Manufacturer

Model

Capacity factor

Electricity exported to grid

Electricity export rate

kW

160.00

W

160,000

%

12.0%

MWh

168.2

BDT/MWh

50,000.00

500 unit(s)

mono-Si - SPR-320E-WHT

Sunpower

Incremental initial costs

BDT 50,000,000

[See product database](#)

Fig 4: Proposed case Power System

EMISSION ANALYSIS:

This worksheet helps determine the annual reduction in the emission of greenhouse gases stemming from using the proposed technology in place of the base case technology. The user has the choice between performing a simplified, standard or custom analysis [2]. The investigation can be done by any of the three strategies and concurring to it subtle elements are to be given. The transmission and conveyance misfortunes should be considered to be as moo as conceivable because it will influence the total generation and taken a toll of the vitality. The result is given in frame of sum of the carbon dioxide emissions reduced which is appeared within the shape of either barrels of rough oil not consumed or other preservation reciprocals as is given in the program. The sheet for emission analysis is as given in figure-5

Base case electricity system (Baseline)		GHG emission factor (excl. T&D)
Country - region	Fuel type	tCO2/MWh
Banqladesh	All types	0.584
Electricity exported to grid		MWh 168
GHG emission		
Base case	tCO2	98.3
Proposed case	tCO2	0.0
Gross annual GHG emission reduction	tCO2	98.3
GHG credits transaction fee	%	
Net annual GHG emission reduction	tCO2	98.3
GHG reduction income		
GHG reduction credit rate	BDT/tCO2	

Figure-05: Emission Analysis

COST ANALYSIS:

In this sheet we need to give all the details of the cost of various components required for the establishment of the combined system. In this worksheet, the user enters the initial, annual, and periodic costs for the proposed case system as well as credits for any base case costs that are avoided in the proposed case (alternatively, the user can enter the incremental costs directly). The user has the choice between performing a pre-feasibility or a feasibility study. For a “Pre-feasibility analysis,” less detailed and less accurate information is typically required while for a “Feasibility analysis,” more detailed and more accurate information is usually required. Since the calculations performed by the RETSCREEN Software for this step are straightforward and relatively simple (addition and multiplication), the information found in the online manual for each input and output cell should be sufficient for a complete understanding of this worksheet.[2] The figure -06 is cost analysis.

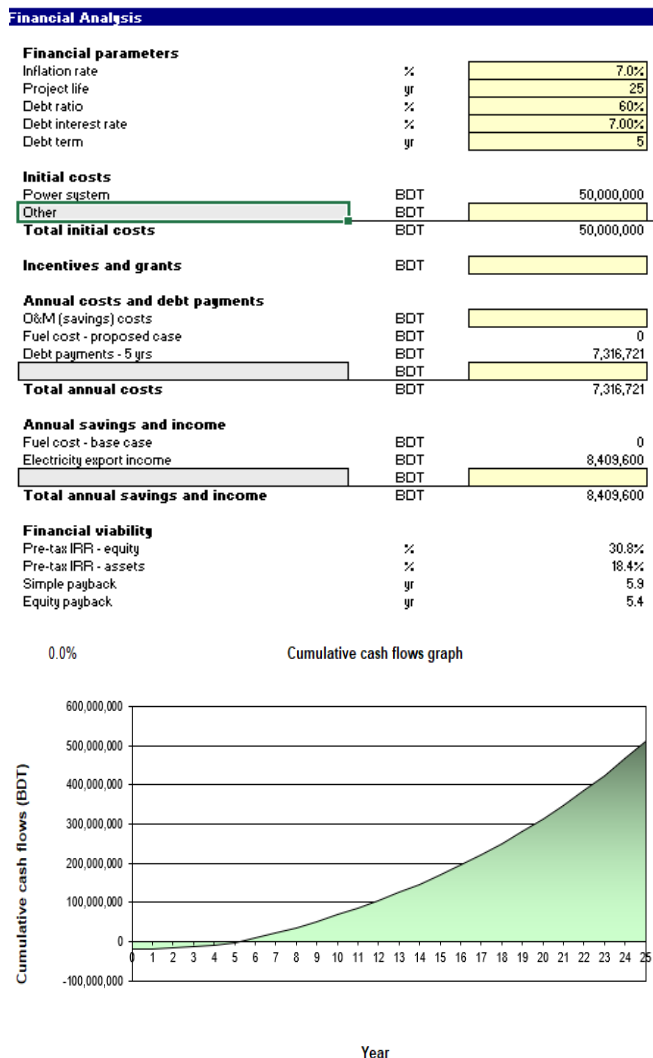


figure -06: cost analysis

IV. CONCLUSION

The results obtained by using RETSCREEN software can be very realistic and gives very promising results for Hybrid systems. The main feature of this software is; it will integrate the local climatic conditions and hence planning of energy model is simpler [5]. The future can be further analyzed utilizing the monetary examination and the chance analysis sheets. In this way we will arrange for any combined technology using the RETSCREEN. It could be an arrangement to any design who needs to plan a CET (Clean Energy Technology) associated framework innovation. This venture can be taken as a startup for changing over an existing technology to CET in future without a sudden influx of cash.

V. ACKNOWLEDGEMENT

We are generously grateful to my honorable faculty S.M. IMRAT RAHMAN and only because of his consolation, oversight and guidance from the starter to the finishing up level empowered us to build up a comprehension of the subject.

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