

PERFORMANCE OF SOLAR ROOF TOP SYSTEM (UNDER DPDC)

**A Field study and Thesis submitted in partial fulfillment of the
Requirement for the Award of Degree of
Bachelor of Science in Electrical and Electronic Engineering**

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Certification

This is to certify that this field study and thesis entitled “**Solar Roof Top(SRS) (under DPDC)**” is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on December 2018.

Supervised by:

A rectangular box containing a handwritten signature in black ink. To the left of the signature, the word 'For,' is written. Below the signature, the date '24.12.18' is written. The signature appears to be 'Dr. M. Shamsul Alam'.

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Dedicated to...

OUR BELOVED PARENTS

TABEL OF CONTNEN

List of Figures	iv
List of Tables	v
List of Abbreviations	vi
List of Symbols	vii
Acknowledgment	viii
Abstract	ix

CHAPTER-01: INTRODUCTIONS **01-03**

1.1 Introduction	01
1.2 Statement of the problem	02
1.3 Objectives of the research	03
1.4 Scope of the research	03
1.5 Thesis outline	03

CHAPTER-02: LITERATURE REVIEWS **04-20**

2.1 Introduction	04
2.2 Renewable energy	05
2.2.1 Wind Power	05
2.2.2 Hydroelectric Power	06
2.2.3 Geothermal Energy	08
2.2.4 Bio-energy plant	09
2.2.5 Solar Energy	10
2.3 Top ten countries using solar power	12
2.4 Solar Radiation Models with GIS	12
2.5 On grid solar system	13
2.6 Off grid solar system	14
2.7 Solar energy attractive in Bangladesh	15
2.8 Photovoltaic Array	16
2.9 Passive Tracking Systems	17
2.10 Working of Photovoltaic	17
2.11 Charge Controller	18

2.12 Battery section	19
2.11 Inverter section	20
CHAPTER-03: METHODOLOGY	21-25
3.1 Introduction	21
3.2 Solar energy survey flow Chart	22
3.3 Site Selection map	23
3.4 Describe narayangonj city	23
3.5 Survey of narayangonj	24
3.6 Survey Questionnaires for (SRS) under DPDC	25
CHAPTER-04: RESULTS AND DISCUSSIONS	26-38
4.1 Introduction	26
4.2 Total consumers	27
4.3 Information of Installation	28
4.4 Maintenance of SRS	31
4.5 Cost Analysis of SRS	33
4.6 Consumer Opinion	34
4.7 Facing any kinds of survey	35
4.8 Consumer satisfaction	36
4.9 Thesis Finding	36
4.9.1 Lack of knowledge	37
4.9.2 Technical Issues	37
4.9.3 Government Initiative	37
4.9.4 Need to change consumer	38
4.10 Recommendations	38
CHAPTER-05: CONCLUSIONS	40-41
5.1 Conclusions	40
5.2 Future Scopes of the work	41
REFERENCES:	42

LIST OF FIGURES

Figure	Figure Caption	Page No
2.1	Block Diagram of Wind Power	05
2.2	Wind power	06
2.3	Hydroelectric power	07
2.4	Geothermal Energy	08
2.5	Bio-energy plant	10
2.6	Solar power generation block diagram	10
2.7	Solar panel	11
2.8	On grid solar system	13
2.9	Off grid solar system	14
2.10	Future Prospect of solar energy	15
2.11	Photovoltaic panel or array	16
2.12	Passive Tracking Systems	17
2.13	working principle of photovoltaic cell	18
2.14	Charge controller	19
2.15	Battery Section	19
2.16	Solar inverter	20
3.1	Site selection Narayanganj	23
4.1	Total consumer	27
4.2	On-grid and off grid consumer	28
4.3	Provide of SRS	30
4.4	Installation presses	31
4.5	Test the regular basis	33
4.6	Consumer opinion	34
4.7	Facing any kinds of survey	35
4.8	Consumer satisfaction	36

LIST OF TABLRS

Figure	Figure Caption	Page No
2.3	Top ten countries using solar power	12
3.6	Survey questionnaires for (SRS) under DPDC	25
4.1	Installment Condition	29
4.2	Cleaning the solar panel	32

LIST OF ABBREVIATIONS

CD	Chromatic Dispersion
EMI	Immune to Electromagnetic Interference
FBG	Fiber Bragg Gratings
LED	Light Emitting Diodes
MD	Material Dispersion
NLSE	Nonlinear Schrödinger Equation
PMD	Polarization Mode Dispersion
PUA	Piecewise Uniform Approach
RMS	Root Mean Square
TFBG	Tilted Fiber Bragg Gratings
UV	Ultraviolet
WD	Wave-guide Dispersion
WDM	Wavelength Division Multiplexed
DPDC	Dhaka Power Distribution Company

LIST OF SYMBOLS

λ	Wavelength
Z	Position along the grating
N	Mode index
F	Fundamental Frequency
ω	Angular frequency
M	Modulation Index
T	Fundamental Time Period

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First of all, we give thanks to Allah or God. Then we would like to take this opportunity to express our appreciation and gratitude to our field study and thesis supervisor **Dr. M. Shamsul Alam, Professor, Department of EEE, Faculty of Engineering**, for being dedicated in supporting, motivating and guiding us through this field study. This field study can't be done without his useful advice and helps. Also thank you very much for giving us opportunity to choose this field study.

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ABSTRACT

Daily headlines create everybody alert to the damaging long effects of power generation from the fossil fuels. It's wide believed that continued to rely on fossil fuels to get electricity will cause serious environmental issues. Moreover, fossil fuels area unit finite in quantity and price a great deal of cash also. Hence, renewable energy may be a potential answer to fulfill up electricity demand for the developing countries like Bangladesh. Among all the renewable technologies, star picture voltaic (PV) is that the most potential, favorable and promising one that converts solar power into current, together with or excluding battery backup. though star technology has nearly been self-made in rural area unites wherever most of the technologies are adopted supported star Home System (SHS), it's not however been effective in urban areas once the obligatory rule of meeting third-dimensional of sunshine fan load of a building. We've investigated the put in star upside of eighty six homes in Narayanganj, wherever the star systems of most of the homes were found inactive .Among them solely fifty systems area unit active. During this thesis the analysis of urban star prospect has been wiped out 3 layers supported this investigation. A comparable discussion on price potency of various star panels has been given reckoning on amounts of masses being run .Economical batteries area unit sculptured by SHS in context of Bangladesh to improvise PV systems. a value analysis has been performed by software package SRS for various sorts of watt peak ranges. with the exception of these, a restored style of system has been planned to create urban upside star installation effective and self-made

Chapter- 1

Introduction

1.1 Introduction:

Solar energy in one type or another is that the supply of nearly all energy on the world. Humans, like all alternative animals and plants, consider the sun for heat and food. However, individuals additionally harness the sun's energy in several alternative al tentative ways. as an example, fossil fuels, plant matter from a past earth science age, is employed for transportation and electricity generation and is basically simply hold on solar power from immeasurable years agene. Similarly, biomass converts the sun's energy into a fuel, which may then be used for warmth, transport or electricity. Wind energy, used for many years to produce energy or for transportation, uses air currents that area unit created by star heated air and therefore the rotation of the world. These days wind turbines convert alternative energy into electricity likewise as its ancient uses. Even electricity springs from the sun. Hydropower depends on the evaporation of water by the sun, and it's later come to the world as rain to produce water in dams. Photovoltaic's (often abbreviated as PV) may be a straightforward and chic methodology of harnessing the sun's energy. PV devices (solar cells) area unit distinctive in this they directly convert the incident radiation into electricity, with no noise, pollution or moving components, creating them strong, reliable and long lasting. Star cells area unit supported an equivalent principles and materials behind the communications and laptop revolutions, and this CDROM covers the operation, use and applications of electrical phenomenon devices and systems. Solar energy is the energy obtained by capturing heat and light from the Sun [1]. Energy from the Sun is referred to as solar energy. Technology has provided a number of ways to utilize this abundant resource. It is considered a green technology because it does not emit greenhouse gases. Solar energy is available abundantly and has been used as a power source and heat source as long as possible. Solar energy obtained by capturing heat and light from the sun. The method of getting electricity from sunlight is referred to as photovoltaic method. This is achieved using a semiconductor material.

Active Solar – Active solar techniques use photovoltaic systems, frequent solar energy and solar water heating. Active solar direct dry cloth and wind heating such activities are consolidated

Passive Solar – Inactive solar tactics include concentrating on a building in the sun, selecting materials with optimal heat mass or light spreading characteristics and sending the air normally

.

1.2 Statement of the problem:

First of all many people can't afford it, or they don't have enough sunny space in their yard or on their roofs to even begin to make it worthwhile. A local solar power installer asked to evaluate my home and property for free to see if I could install a reasonable solar power system. OK, I said, because it was free. The answer back was as I expected: No. Roofs point the wrong way and too many trees in our yard, so solar would not work for me even if I wanted it. Solar power, like wind power, is intermittent. It does not provide continuous power, so i would have to ask how it would benefit me. If I lived in sunny, hot Arizona I might consider using solar power to make ice to keep my home cool. (It sounds funny but ice can be used as an energy storage mechanism in certain situations.) I would have to find another storage mechanism because here in Massachusetts ice would not work well for me. Frankly I don't want to have to pay for a solar installation PLUS huge batteries which can only be delivered by forklift and then replace those batteries every decade or less. Some people, as in the answer from Ladislav Teaberry, use solar power to reduce the amount of electricity they buy from the grid. So what happens when "too many" people are not buying electricity from the grid or, worse, selling cheap power to the grid? The grid is a business itself. It buys and sells power. The REAL power companies have fixed expenses plus fuel cost and if they cannot pay their bills because of competition from "too many" solar and wind installations then they go bankrupt and shut down. Then what happens on a cloudy, calm winter day when I want heat and light, and what happen to the US when we go to solar and wind nationwide. Look forward to rolling blackouts and total grid failures when the weather doesn't cooperate

1.3 Objectives of the research:

The objectives of the study are as follows:

- To know the present condition of SRS in Bangladesh and the opinion of the consumers about it.
- Calculate the per unit cost of solar electricity
- Try to make concern consumers about the usefulness of using SRS system.
- Find out the problems that consumers are facing when they are using SRS.
- To give information to the consumers about net metering system of on grid SRS

1.4 Scope of the research:

Daily demand is increasing thanks to high increment and consequently higher prices. Virtually simple fraction of rural household's area unit connected to the grid. to satisfy the gap, alternative energy is taken into account as a doable various for grid areas wherever grid connections aren't accessible .A good variety of organizations are operating along to supply star Home System (SHS) in rural Bangladesh [2]. There's very little proof that provide of tiny scale energy supports important rural development. This paper aims at understanding however magnified energy access through SHS in rural Bangladesh contributes towards rural development. Recent revealed literatures on SHS in Bangladesh are studied to induce insight into the technical, financial, and operational additionally as economic and social problems. Later the findings are critically analyzed with regard to designated indicators of rural development. The study known that magnified access to energy through SHS in rural Bangladesh provides principally recreational and leisure advantages with the therefore referred to as 'social statuses

1.5 Thesis outline:

This thesis is organized as follows:

Chapter 1: Introduction

Chapter 2: Literature reviews

Chapter 3: Methodology

Chapter 4: Result and discussions

Chapter 5: Conclusion

CHAPTER- 2

LITRATURE REVIEW

2.1 Introduction:

Affordable, accessible and secure provide power maintains a drive for the socio-economic development of the country. Recent studies have shown however solar energy plants from solar energy will facilitate in numerous ways in which within the socio-economic development of the country particularly. during this scenario, solar energy is seen as a extremely vulnerable technology for power generation in developing countries .This section seeks to specialize in the criticism, criticism of designated the chosen literature for the aim of reviewing selected literature, driving forces for socio-economic development, housing-income, health, education, and agricultural production, access to data and different socio-economic development problems and matters Infrastructure Services. This operating paper reviews the business history of solar power from the nineteenth century to this. It forms a part of a wider project to reconstruct the history of “green” entrepreneurship. A companion paper revealed has reviewed the business history of wind energy [3]. It tracked the individual international distribution of wind energy capability over time, and debated the relative importance of visionary entrepreneurs and public policy in shaping the company structure of the business. The history of star contains similarities to wind energy, however conjointly wide variations. Like wind, the sun is an apparent supply of energy that has long attracted interest, primarily as a supply of warmth. Like wind conjointly, however evens a lot of dramatically, solar power has ne'er lived up to the potential that its adherents claimed. Even today, European country and Espuma square measure the sole countries wherever solar power accounts for quite one per cent of the electricity generated .Although the sun shined all over on the earth, the abstraction distribution of solar power capability has been extremely skew, and not well related to with resource endowment. Cloudy European country has a lot of electrical phenomenon capability put in than the remainder of the globe combined. Manufacture of electrical phenomenon cells has conjointly been extremely skew. When being primarily focused within the U. S. for many years, simple fraction of production is currently in Asia

2.2 Renewable energy:

Renewable energy is energy that is collected from renewable resources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy often supplies electricity to four key areas: electricity generation, air and water heating / cooling, transportation, and rural (off-grid) power services. Renewable energy is the energy generated from natural processes that are constantly met. It has different forms of sunlight, geological heat, air, tide, water and biomass .This energy cannot be exhausted and is constantly renewed .Energy from a source that is not depleted when used, such as wind or solar power."The environmental benefits of renewable energy"

2.2.1 Wind Power:

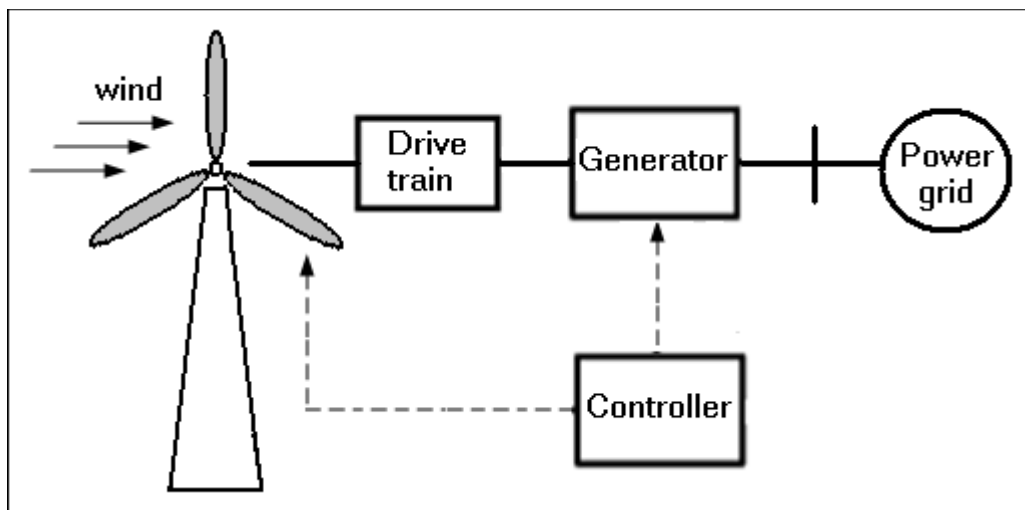


Fig 2.1- Block Diagram of Wind Power

Air can be considered as a form of solar energy, because the air is formed by the Sun's abnormal warmth and cooling (Earth's rotation and other space components). Air flow can be converted by turbines and electricity [4]. In the form of T, ventilation is still used for pumping water in farms How an institution can use it. Wind business is one of the sustainability ideas for businesses that can be included in cutting power consumption.

Commercial-grade air-powered generating systems are available to meet the needs of renewable energy for many organizations:

- Single wind turbine generates electricity as a supplement to an existing electrical supply of an organization. When the wind blows, the power generated by the system offset the utility-supplied electricity requirement.
- Utility-scale wind farms generate electricity which can be purchased in the wholesale power market, contractually or through a competitive bidding process.



Fig 2.2- Wind power

2.2.2 Hydroelectric Power:

The most acquainted variety of electricity power is generated by a system during which dam's area unit made to store water in a very reservoir. Once free, the water flows through turbines to provide electricity. This is often called “pumped-storage hydropower”—water is cycled between lower and higher reservoirs to manage electricity generation between times of low and peak demand. Another sort, known as “run-of-river hydropower,” funnels some of

watercourse flow through a channel and doesn't need a dam. Hydropower plants could also be the dimensions of small-hydroelectric power plants within the kind of Hoover Dam. However an establishment will use it. The direct use of electricity power is of course hooked in to geographical location [5]. A reliable waterway supply is often calculable and available; it is often employed in the subsequent ways:

- Small electricity power plants are often discovered to supply electricity for agricultural and farm cultivation or tiny municipalities.
- Smaller towns can use medium-sized hydroelectric power systems to build up the power of the local waterways



Fig 2.3–Hydroelectric power

2.2.3 Geothermal Energy:

Geothermal energy, because the name implies, comes from the warmth of the planet itself. This heat will be sourced near to the surface or from heated rock and reservoirs of quandary miles at a lower place our feet. Geothermic power plants harness these heat sources to get electricity [8]. On a really tiny scale, a geothermic setup system will facilitate to provide solely around 10 feet close to the bottom temperature near however an establishment will use it. A commercial utilization power solution at a local level of geothermal power may be part of a larger scale in a sustainable business practice. Direct use of geological energy may be included.

- Heating office building or production plants
- Helping to grow greenhouse plants.
- Heating water at fish farms.
- Aiding with numerous industrial processes (e.g., pasteurizing milk).



Fig 2.4- Geothermal Energy

2.2.4 Bio-energy Plant:

This is a sort of renewable energy derived from biomass to form heat and electricity (or to supply liquid fuels used for transportation, like plant product and biodiesel). Biomass refers to any organic matter returning from recently living plants or animals. Though biomass produces an equivalent quantity of carbonic acid gas as fossil fuels, the replacement plant raised as biomass removes the carbonic acid gas from the atmosphere, keeping the environmental impact comparatively neutral. There are numerous kinds of systems for generating such electricity that directly capture from biomass and use alkanet gas production. However cans a corporation use it, Reckoning on your operation, there are many ways to include bio-energy into your property energy plans:

- Organizations can convert to ethanol or biodiesel such as fleeting vehicles that can be used to fail.
- Production facilities may be able to burn live biomass directly, manufacturing vapors captured by a rotary engine for power generation. In some cases, this method may heat the ability further. For instance, paper will use wood waste to heat electricity and steam for heating.
- Farm operations will convert waste from electricity to electricity mistreatment little, standard system
- Cities will faucet the alkanet series gas generated by organic vermicomposting in landfills and use it as fuel for power generation



Fig 2.5- Bio-energy plant

2.2.5 Solar Energy:

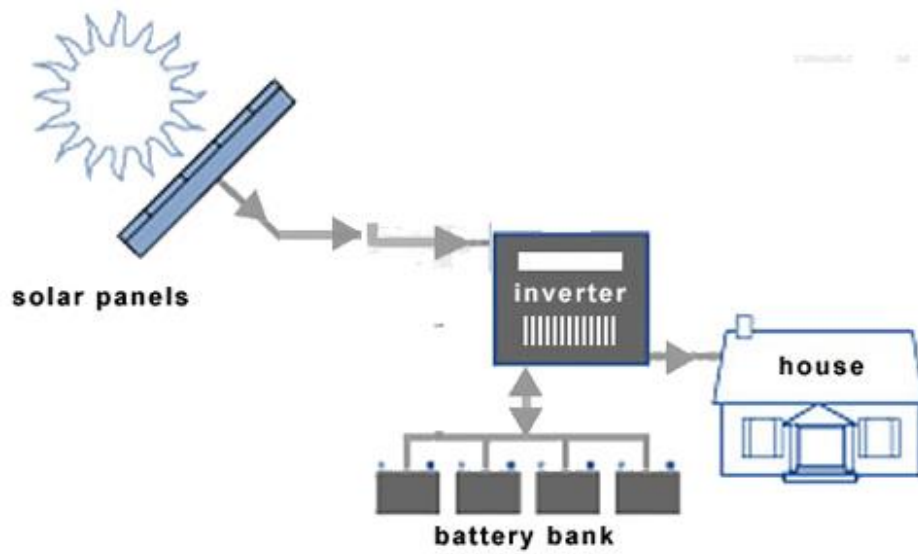


Fig 2.6- Solar power generation block diagram

The energy that we have a tendency to get from the sun is termed alternative energy. The sun is that the main supply of energy. In our day to day life we have a tendency to use energy to accomplish our works. we have a tendency to get this energy from completely different sources like the sun, waves, wind, chemical process, radio activities, burning musket fuel etc. however the most supply of energy is that the sun [7]. The sun produces all the energy within and out of doors of this world. Our body gets energy from the food we have a tendency to take. These foods square measure created directly or indirectly from the plants. Plants create food with the assistance of sun light-weight. But we are able to turn out different energies like electricity, thermal heating etc. from alternative energy. several developed and developing countries square measure exploitation alternative energy for rural electrification .About 20-30 % villagers exploitation solar array for electricity in Bangladesh. The govt. of Bangladesh has taken completely different steps to extend this variety. As this energy is replenished by itself or renewable, we want not expense additional wealth or cash. Besides U.S.A. this energy is setting friendly. So, we must always use alternative energy to avoid wasting the planet from being spoiled



Fig 2.7- Solar panel

2.3 Top ten countries using solar power:

Rank	Country	Total capacity
1	China	78.7%
2	Japan	42.75%
3	Germany	41.22%
4	United Sated	40.3%
5	Italy	11.28%
6	United Kingdoms	1163%
7	India	9.01%
8	France	7.13%
9	Australia	5.9%
10	Span	5.49%

Table 2.1- Top ten countries using solar power

2.4 Solar Radiation Models with GIS:

In the last 20 years, many empirical radiation models are increased by the employment of geographic info systems tools. The quicker process capabilities related to GIS platforms permits for integration of refined radiation models and extra thought of the consequences of topography on incoming radiation (Dub domestic help and made 1995). GIS tools let the user examine the temporal and day abstraction variability of incident radiation on a landscape level (Rich et al. 1994). Integration radiation models among GIS have helped to eliminate the quality of programming GIS functions into mathematical models (Nguyen and Pearce 2010). Moreover, radiation models with GIS can even incorporate environmental and socioeconomic datasets for situation modeling of interest to policy manufacturers (Nguyen and Pearce 2010). Solar Flux is one in all the first GIS-based models (Sure and Hofierka 2004). it had been enforced within the ARC/INFO platform as associate degree ARC Macro Language (AML) program (Dub domestic help and made 1995). This tool simulates the influence of shadow patterns on direct insulation at specific intervals through time (Helios Environmental

Modeling Institute, LLC 2000). It uses the input of a geographic surface with elevation values, latitude, amount for calculation, and part conditions (Dub domestic help and made 1995). The output provided shows direct radiation flux, period of direct radiation; sky read issue and diffuses radiation flux for every surface location (Dub domestic help and made 1995). whereas originally enforced at a spread of temporal and abstraction scales, Sure and Hofierka (2004) justify however star flux uses straightforward empirical formulas whereby input parameters area unit averaged and so doesn't perform well once scheming over giant areas.

2.5 On grid solar system:

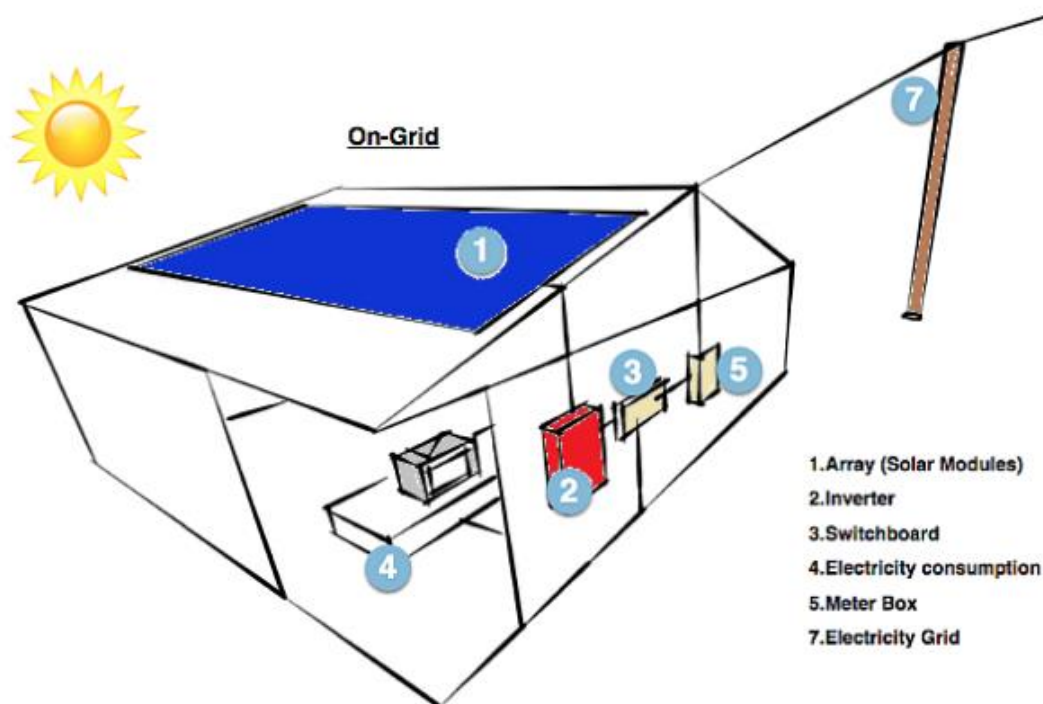


Fig 2.8- On grid solar system

On-grid solar energy systems square measure ones you'll notice most typically, and grid-tied, grid-connect and grid-direct systems visit identical reasonably solar energy systems. Such a system connects to your energy provider just in case your system doesn't turn out enough energy. As a result, AN on-grid system doesn't need to turn out all the energy you need. If it finally ends up manufacturing additional energy than needed, it sends excess electricity to the grid .In the absence of adequate daylight, once star panels cannot work optimum levels, you'll be able to handily draw electricity from the grid to satisfy your necessities. You'll be able to even have a web metering agreement together with your electricity provider, through that you stand to receive compensation for the surplus electricity you give to the grid.

2.6 Off grid solar system:

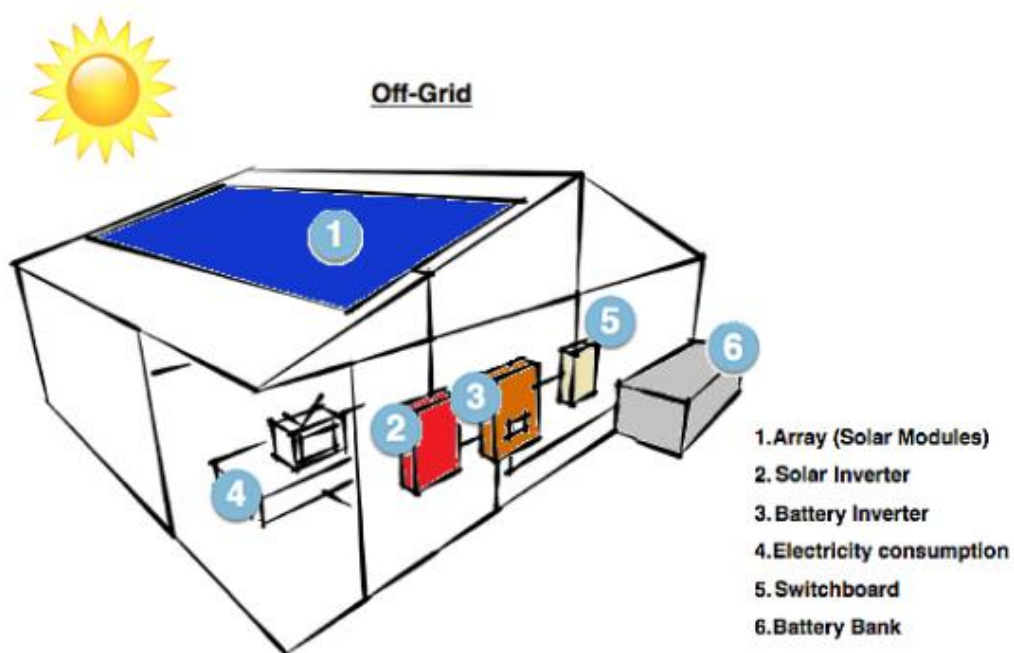


Fig 2.9 - Off grid solar system

The use of off-grid star systems is a lot of common in regional and rural components of Australia, wherever individuals cannot hook up with the grid in the slightest degree. Associate in nursing off-grid solar energy system runs severally of the grid, and it needs enough PV panels to require care of all of your power desires. Since homes tend to possess higher demands for power in evenings and nights, once production is lowest or absent, such

systems usually use batteries or believe backup within the sort of a generator. Off-grid systems are positively a lot of complicated than their on-grid counterparts, and that they supply significantly lesser flexibility.

2.7 Solar energy attractive in Bangladesh:

As the time passes by, demand of energy is increasing with an increase in the world's population. From different corporations to small households, people need energy to perform daily tasks. As the science and technology is developing, people's lives are also becoming more complex [10]. To meet energy demands, renewable energies such as solar is used besides other sources. This research intends to investigate whether there is any future prospect of solar energy in Bangladesh. It is an exploratory research. 1. Bangladesh is situated between 20.30 – 26.38 degrees north latitude and 88.04 – 92.44 degrees east longitude. 2. Daily average solar insolation rate is 4 to 6.5 KWh per square meter. 3, Maximum amount of radiation is available on the month of March- April (6.5h) and minimum on December- January (4h).

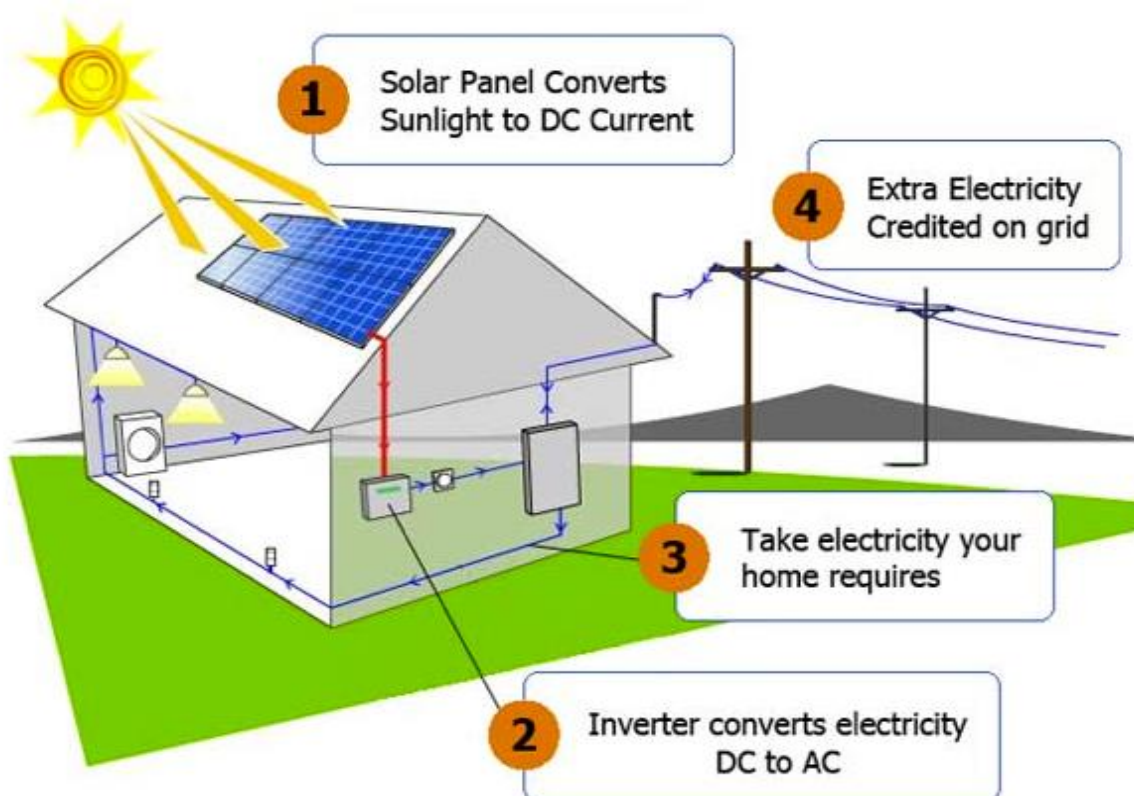


Fig 2.10- Future Prospect of solar energy

2.8 Photovoltaic Array:

A photovoltaic array (or solar array) is a linked collection of solar panels. The power that one module can produce is seldom enough to meet requirements of a home or a business, so the modules are linked together to form an array. Most PV arrays use an inverter to convert the DC power produced by the modules into alternating current that can power lights, motors, and other loads. Modules in a PV array are usually attached to the series to obtain the first desired voltage; allow the individual string system to produce more current, then parallel to it. Solar panels are usually measured in watts according to STC (Standard Test Conditions) or PTC (PVUSA testing conditions). Typical panel rating is more than 100 watts less than 400 watts. A set of array ratings panel ratings, made of watts, kilowatts, or megawatts.

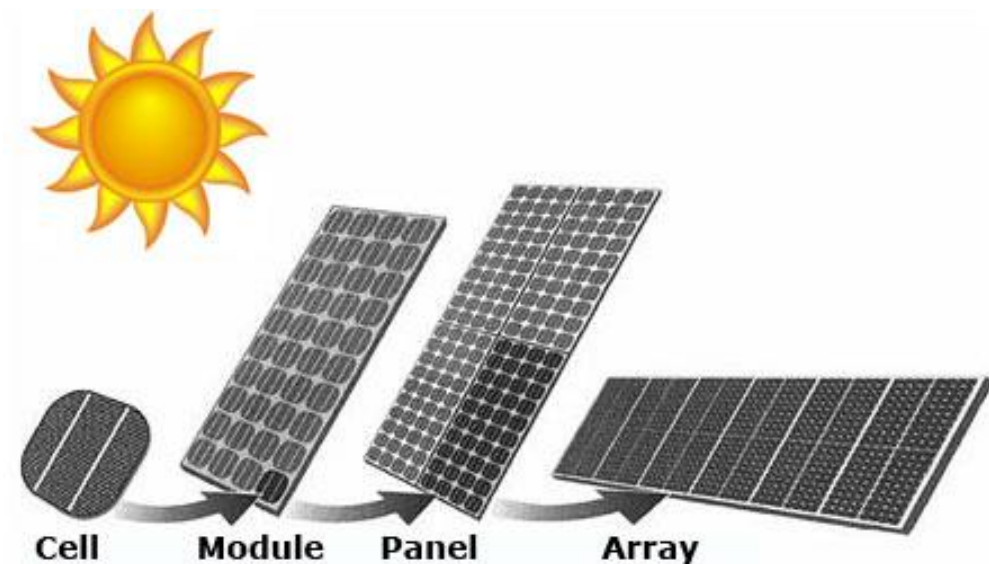


Fig 2.11- Photovoltaic panel or array

2.9 Passive Tracking Systems:

An automated system (in which solar panels are mounted), tracks sun's position accurately in order to maximize the power yield. Everyday sun rises in the east and move across the horizon toward west (solar azimuth angle) as illustrated in Fig. 2. A field of sunflowers rotate according to the sun motion (east to west) throughout a sunny day such that each leaf seek maximum light heliotropism, a clever bit of natural engineering [12]. Sun changes its position throughout the days, years and seasons. To increase the energy production from PV panels, it is necessary to rotate the PV panels accordingly. It can be realized that more power will be generated if PV panel is exposed (for more time) towards the sun, so they can harness more sunlight. This idea describes solar tracking

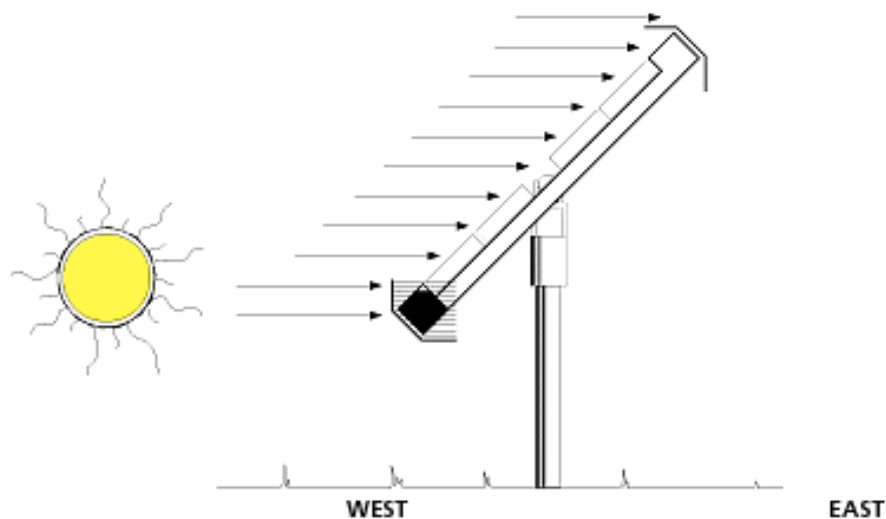


Fig 2.12- Passive Tracking Systems

2.10 Working of Photovoltaic:

Photovoltaic are the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, electric current results that can be used as electricity. A solar cell (also called photovoltaic cell or

photoelectric cell) is a solid state electrical device that converts the energy of light directly into electricity by the photovoltaic effect. Crystalline silicon PV cells are the most common photovoltaic cells in use today. Multiple solar cells are electrically connected to each other and mounted on a support frame or frame is called a photovoltaic module. Modules are designed to provide electricity at a specific voltage, such as a normal 12-volt system. Presently produced modules depend directly on how light strikes [13]. Multiple modules can be wired together to form an array. In general, the larger the area of a module or array, the more electricity will be produced. Photovoltaic modules and arrays produce direct-current (DC) electricity. They can be connected in both series and parallel electrical arrangements to produce any required voltage and current combination.

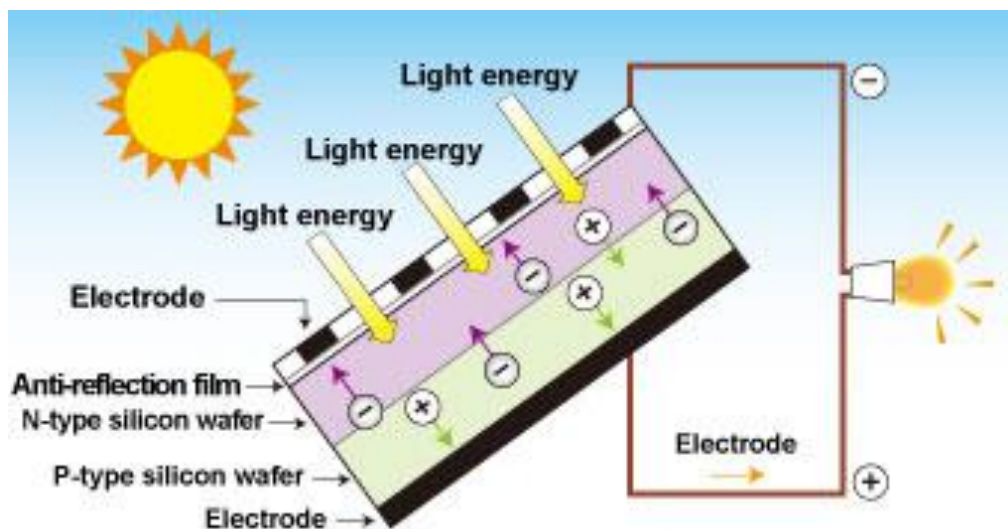


Fig 2.13- working principle of photovoltaic cell

2.9 Charge controller:

Battery is included in a system, the charge controller requirements come forward. A charge controller controls to build up the uncertain voltage. On a bright sunny day, solar cells produce more voltage which can damage the battery. It can be a charge controller to maintain battery charge balance.



Fig 2.14- Charge controller

2.12 Battery section:

To store charges batteries are used. A lot of batteries are available in the market. But not all of them are suitable for solar PV technology. The most used batteries are nickel / cadmium batteries. Among other energy's high energy density there are batteries like sodium / sulfur, zinc / bromine flow batteries .But for medium-term batteries, the best cycling efficiency of nickel / metal hydride batteries. Iron / chromium red balls and zinc / manganese batteries are best for long-term alternatives.



Fig 2.15- Battery section

2.11 Inverter section:

A grid-tie process is a private solar power plant that is connected in parallel to the electric grid and creates power in the condominium and / or electric grid [14]. Your process produces more than 100% of your energy desires, it will again send electrical power to the grid and your electric power meter will actually turn counter-clockwise!! (Additional cutting-edge Digital Meter to calculate step-by-step in each recommendation). With internet metering programs now, many property owners are experiencing the benefits of sunlight electrical power by lowering their monthly expenditures and removing electrical cost for more than twenty years.



Fig 2.16- solar inverter

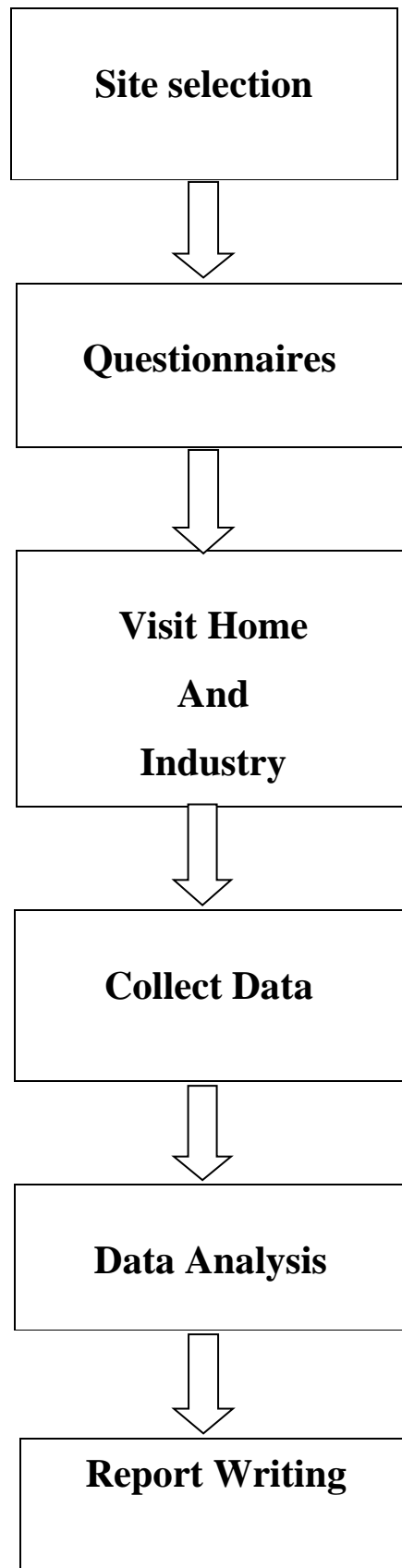
CHAPTER- 3

METHODOLOGY

3.1 Introduction:

The main purpose of the research is to evaluate or create exiting understanding, review and investigate existing situation or problems, find out the appropriate solutions to the problems as well explain new idea and generate scope of further research. Research on the issues on tourism sector is to focus on problems of the specified sector and find out appropriate solution of research. The sun is a major source of inexhaustible free energy (i.e., solar energy) for the planet Earth [15]. Currently, new technologies are being employed to generate electricity from harvested solar energy. These approaches have already been established and area unit wide practiced throughout the globe as renewable alternatives to traditional non-hydro technologies. This study was designed to get the socio-economic effects of SBS in remote rural areas of East Pakistan .Based on the initial info of the analysis. Secondary supply is employed. Thanks to technological-based social analysis, a combination of qualitative and quantitative systematic approaches is applied. General info concerning the SBS Promoting computer programmer and also the socio-economic effects of alternative energy is collected from secondary sources and interviews with native consultants. The first information assortment is collected through in depth applied math strategies victimization question papers. Secondary sources area unit accustomed support measure info. The form was designed before and before the SHS installation to live the role of SHS within the socio-economic development of rural areas. Solar power is that the conversion of daylight into electricity, either directly victimization electrical phenomenon (PV), or indirectly victimization focused alternative energy (CSP). Focused alternative energy systems use lenses or mirrors and trailing systems to focus an outsized space of daylight into little beam. Photovoltaic convert light into electric current using the photovoltaic effect. Photovoltaic were initially, and still are, used to power small and medium-sized applications, from the calculator powered by a single solar cell to off-grid homes powered by a photovoltaic array.

3.2 Solar energy survey flow Chart:



3.3 Site Selection map:



Fig 3.1– Site selection Narayanganj

3.4 Describe narayanganj city:

Narayanganj Jela is a district in central Bangladesh, part of the Dhaka Division. The ancient city of Sonargan is in Narayanganj. It's located in the bank of Meghan and Shytolkha River. The main centre of the district is Narayanganj City [16]. Its adjuncts with its capital city of Dhaka. Narayanganj is one of the oldest industrial District of Bangladesh .It is also a center of business and industry, especially the jute trade and processing plants, and the textile sector of the country. It is nicknamed the Dundee of Bangladesh due to the presence of many jute mills. Dundee was the first industrialized "Jute polis" in the world. It is number one district for economy of Bangladesh.

Infrastructure Development Company restricted (IDCOL) signed a finance Agreement with Leroy Jones Renewable Energy Ltd. (BREL) for a 168 kWp star mini-grid to be placed at Nooner investigator Island in Sonargan of Narayanganj district. Total price of the project is BDT seven.14 core of that IDCOL can offer half-hour as soft loan and five hundredth as grant. IDCOL has received fund for finance such comes from the planet Bank, DFID, JICA, KWP, ADB and USAID .The project can provide electricity to 688 households and nineteen business entities. Since the island is placed on the water of the Meghan stream, providing grid

electricity to the project location is difficult for the govt. The projected project can guarantee uninterrupted provider of grid quality electricity to the folks of that space which can expectedly increase the standard of life and increase financial gain generating activities. IDCOL, a government in hand Non-Bank institution, could be a pioneer organization for promoting renewable energy technology in Asian country. As of Gregorian calendar month 2015, quite three.6 million star Home Systems, 38,313 domestic biogas plants, 148 star irrigation pumps, five biogas based mostly power plants are put in below IDCOL Renewable Energy Program. IDCOL incorporates a vision to finance 1550 star irrigation pumps, fifty star mini grids, and hundred thirty biogas based mostly power plants by 2017.

3.5 Survey of narayangonj:

We are surveying for solar rooftop system (SRS) under (DPDC) site choice of narayangonj circle. We are two groups divided for survey narayangonj west and narayangonj east. Me and my group member visit narayangonj west some home and industry, we are some place visit of dhanmondi home of solar. We tell about solar user consumer and collect data. We do some questions solar rooftop system for consumers.

3.6 Survey Questionnaires for (SRS) under DPDC:

Table 3.1- Survey Questionnaires for (SRS) under DPDC

SL	Indicator	Question	Description
1	Consumer information	Owner Name Name of the NOCS Address Phone No Does your organization rent or own the property?	In this question section we have just collected basic information about a consumer
2	Information of installation	Why do you install this SRS? What kind of solar rooftop system (SRS) are you installed? From where you bought SRS? What is the main reason for the system disorder?	We asked the consumer about the installation date, some consumer installed on grid and some are off grid SRS
3	Maintains	Do you ever clean your SRS? Do you monitoring SRS? Do you test the regular basis? How many days ago? Do you want to repair? Do you face any kind of survey?	We asked the consumer about SRS clean and monitoring
4	Cost analysis	What is the total cost of SRS? Do you think, it is a waste of money?	We asked some question about cost analysis of SRS
5	Consumer satisfaction	Are you satisfied using solar rooftop system? Do you think this SRS is useful?	We asked some question about consumer satisfaction of solar rooftop system

CHAPTER- 4

RESULTS AND DISCUSSIONS

4.1 Introduction:

The global warming due to greenhouse gas emission and the energy scarcity worldwide are prompting almost all the countries in the world to look for alternative sources of energy such as nuclear and renewable such as solar, wind, geo-thermal and wave energies, which do not cause carbon emission. Whereas developed countries can tap into nuclear energy, a developing country like Bangladesh is not fortunate enough to have that option available. Consequently, the only option that is open to Bangladesh at the moment is renewable energy such as solar and hydro-electric. Bangladesh is a semi-tropical region lying in northeastern part of South Asia gets abundant sunlight year round. The average bright sunshine duration in Bangladesh in the dry season is about 7.6 hours a day, and in the monsoon season is about 4.7 hours. Presently Global warming and climate changes effect is the burning issue all over the world. Bangladesh will be the most affected country in the climate changes effect round the world. There are so many causes of global warming[17]. Among them power generation is the most remarkable one. We cannot think about any development without power (Electricity). Finally, sources of conventional energy like Fossil fuel, Natural gas and coal are limited. If we use them in the present rate it will be finished within the short time. So, there is no other way to think about environmental friendly renewable energy production sources. In Bangladesh context solar energy is the most effective source for renewable energy production.

4.2 Total consumers:

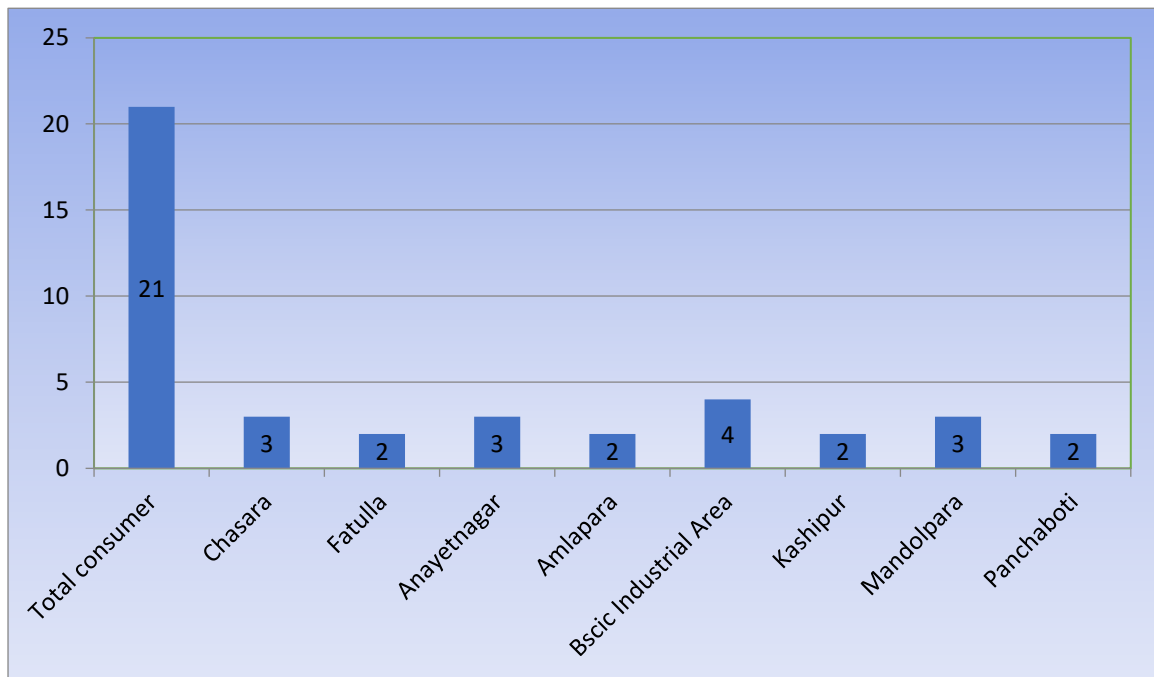


Fig 4.1- Total consumer

We have visited narayangonj solar rooftop system (under DPDC). We do survey East Zone 58 consumer and West Zone 28 consumer. So the total consumption of Narayangonj is 86. We visit solar rooftop system narayangonj east zone some area (i.e., caesura, futile, anayetnagar and Amlapara). We visit every area and have done some related question solar rooftop energy. Total consumer of east zone 10 , Chasara solar rooftop user consumer 3, Fatulla 2, anayetnagar 3 and Amlapara 2 of narayangonj east zone. Narayangonj west zone some area (i.e., bscic industrial area, Kashipur, manolpara and panchabati). We visit total 11 consumer of west zone, every area and have done some related question solar rooftop energy. Basic industrial area solar rooftop user consumer 4 , Kashipur 2, mondolpara user 3 and panchobati 2 users of solar rooftop system of narayangonj west zone.

4.3 Information of installation:

- On-grid and off –grid consumer
- Installment Condition
- Provide of SRS
- Installation process

➤ **On-grid and off –grid consumer**

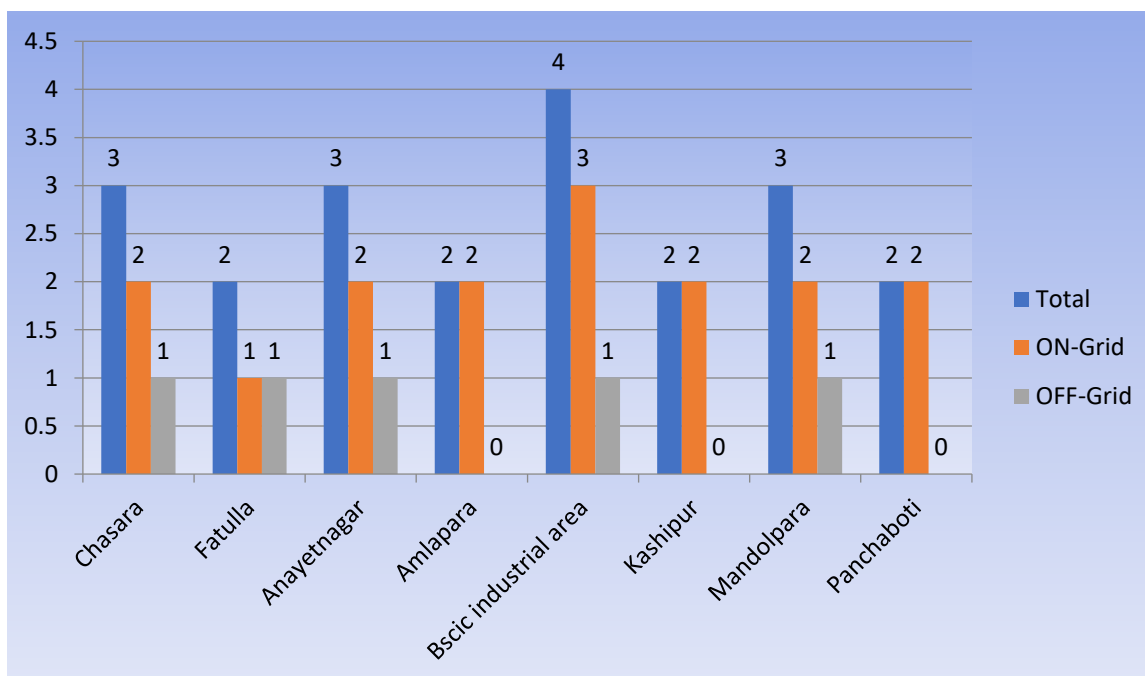


Fig 4.2- On-grid and off –grid consumer

This figure represents eight areas. In the area of Chasara, there are total 3 consumers in which 2 are ON Grid and 1 is OFF Grid. Therefore, most of the consumers are ON Grid. Now in Fatulla, there are total 2 consumers in which 1 are ON Grid and 1 is OFF Grid. Therefore, most of the consumers are ON Grid. Again in Anayetnagar, there are total 3 consumers in which 2 are ON Grid and 1 OFF Grid. Therefore, most of the consumers are ON Grid. In the area of Amlapara, there are total 2 consumers in which 2 are ON Grid and no OFF Grid. Therefore, most of the consumers are ON Grid. In the area of Bscic industrial area, there are total 4 consumers in which 3 are ON Grid and 1 is OFF Grid. Therefore most of the consumers are ON Grid. Now in Kashipur, there are total 2 consumers in which 2 are ON

Grid and no are OFF Grid. Therefore most of the consumers are ON Grid. Again in Madonpur, there are total 3 consumers in which 2 are ON Grid and 1 OFF Grid. Therefore, most of the consumers are ON Grid. At last in Panchobati there are total 2 consumers in which 2 are ON Grid and no OFF Grid and another consumer is disabled. Therefore, most of the consumers are ON Grid. Finally we can say that most of the solar systems are on-grid and in Basic industrial area we found the maximum number of on-grid SRS.

➤ **Installment Condition:**

Solar panel place	Visit Consumer	Installment Condition	
		Turn on	Disorder
Home	10	8	2
Hospital	2	2	0
Academy	5	4	1
Industry	4	3	1

Table 4.1 - Installment Condition

Installment conditions of solar rooftop system someplace visit (i.e. home, hospital, collage and basic industrial area). Total consumer of home 10, hospital 2, Collage 5 and industrial area 4 visit of me and my group member. Install turn at home of 8 consumer and disorder 2 consumer, Tehran on 2 hospitals and no consumer disorder of solar rooftop system, academy turn on 4 and disorder 1 consumer, basic industrial area 6 consumer visit result of turn on 3 consumer and 1 consumer disorder.

➤ **Provide of SRS:**

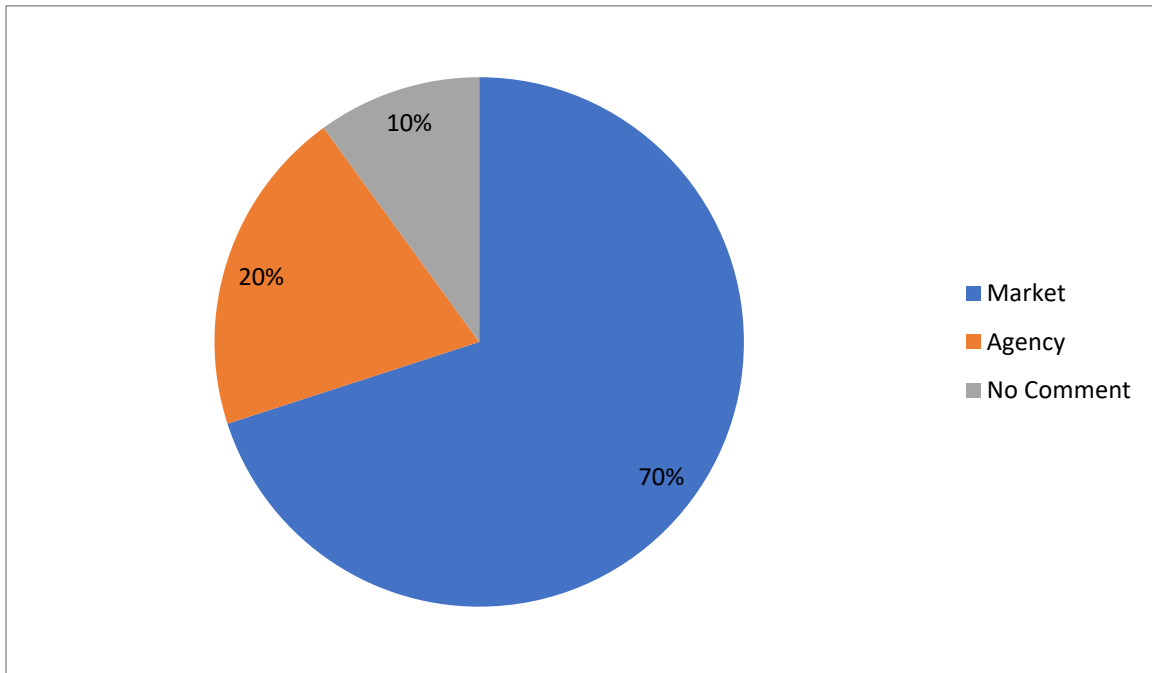


Fig 4.3 - Provide of SRS

This figure represents the provider of SRS. In this case we observe that more than 70% consumer uses local market, SRS where only 20% people buy SRS from agency suggested by DPDC.

- **Installation process**

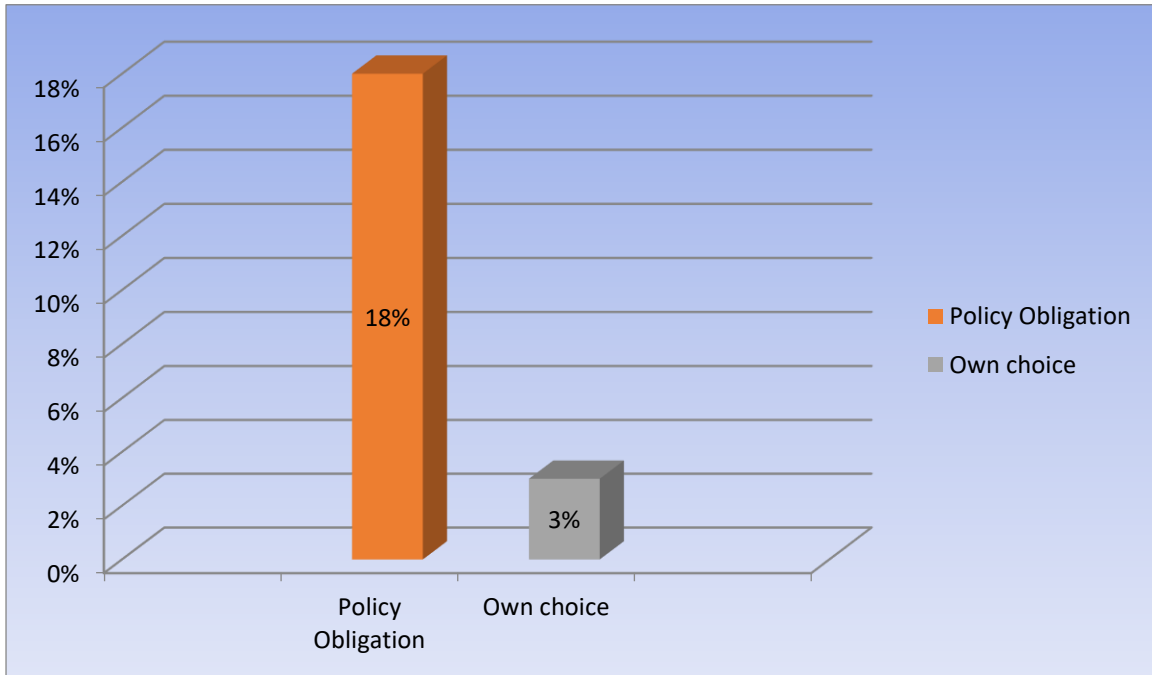


Fig 4.4- Installation process

Figure 4.4 provides information that 23 consumers have installed SRS for the policy obligation. That means they have no interest to install the solar system. Another 2 consumers are interested to install the SRS system. That's why they installed SRS for their own choice.

4.4 Maintenance of SRS:

There are two types in maintenance of SRS:

- Cleaning the solar panel
- Test the regular basis

➤ **Cleaning the solar panel:**

Solar panel place	Total Consumer	Cleaning solar panel	
		Clean it	Does not clean
Home	10	2	8
Hospital	2	0	2
Industry	4	1	3
Academy	5	1	4

Table 4.2 - Cleaning the solar panel

We visit narayangonj east and west zone some area (i.e, home, hospital, industry and academy) solar rooftop system (under DPDC) cleaning the solar panel some questions for consumers. Total consumer list number 10 for home, hospital 2, industry 4 and academy 5. Solar panel cleans it 2 consumers and does not clean 8 consumers. Hospital consumer cleans it no consumer and does not clean 2 consumers. Solar energy industry user consumer cleans it 1 and does not clean 3. At last academy 1 cleans it and 4 do not clean.

➤ **Test the regular basis:**

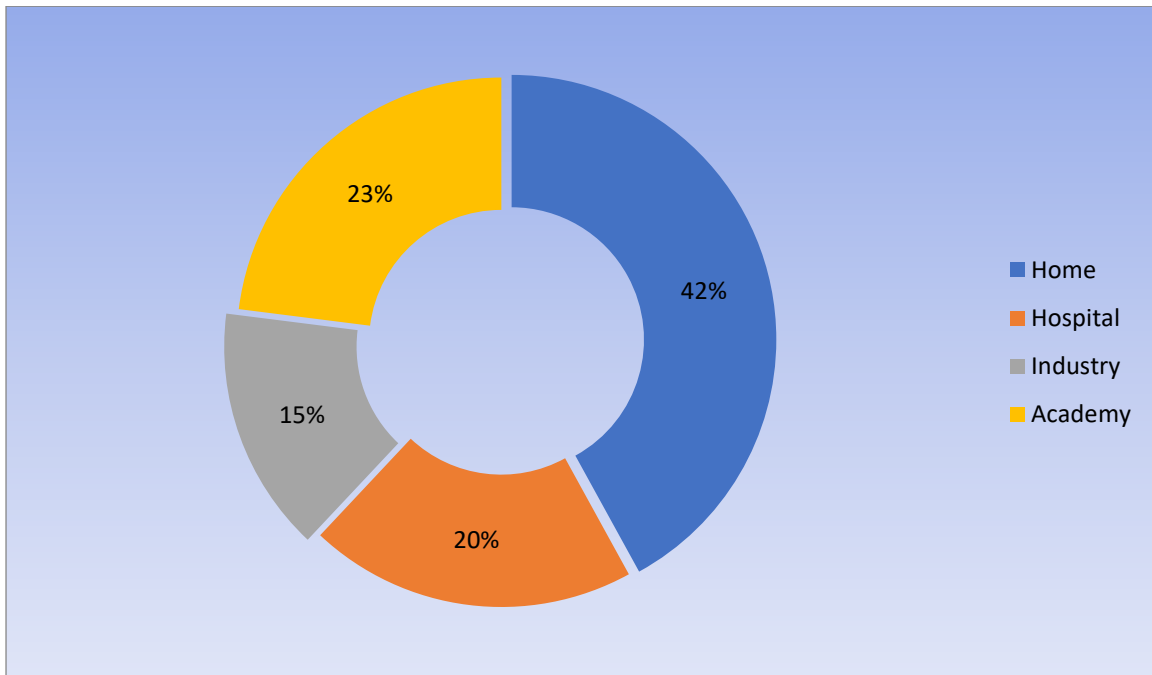


Fig 4.5- Test the regular basis

In this graph represents four areas. In the area of housing there are 42% consumers in which Test the regular basis. Next in the area of the academy there are 23% consumers in which Test the regular basis. Again in the area of industry, there are 15% consumers in which Test the regular basis. Last on in the area of hospital there are 20% consumers in which Test the regular basis. Therefore, most of the consumers are house is Test the regular basis. Therefore, most of the consumers are industry is no Test the regular basis.

4.5 Cost analysis of SRS:

Consumer name: Md. Mustafuzur Rahman

Address : Basic industry area, Narayangonj

Installed by : Grameen Shakti

Installation date: 02-06-2016 (On grid solar rooftop system)

Capacity : 2 KW

Price : 1, 00,000 BDT

Energy generated =1800 KWh (02-06-2016 to 19-11-2018)

Total energy generated per month = $1800/29 = 62$ KWh

Energy generated per year = $62 \times 12 = 744$ KWh

Life time energy generated = $744 \times 20 = 14,880$ KWh

Cost per unit = $1,00,000 / 14,880 = 6.72$ BDT

4.6 Consumer Opinion:

In the following chart the comparisons of the how many consumers accept the system. As a waste of money and how many of their finds it useful .The comparison shows that 21 consumers are judged totally. According to the result 8 consumer thinks that the installed system has just been a waste of their money, 5 consumers found wanting to increase capacity, useful 5 consumers and only 3 consumers on the comment.

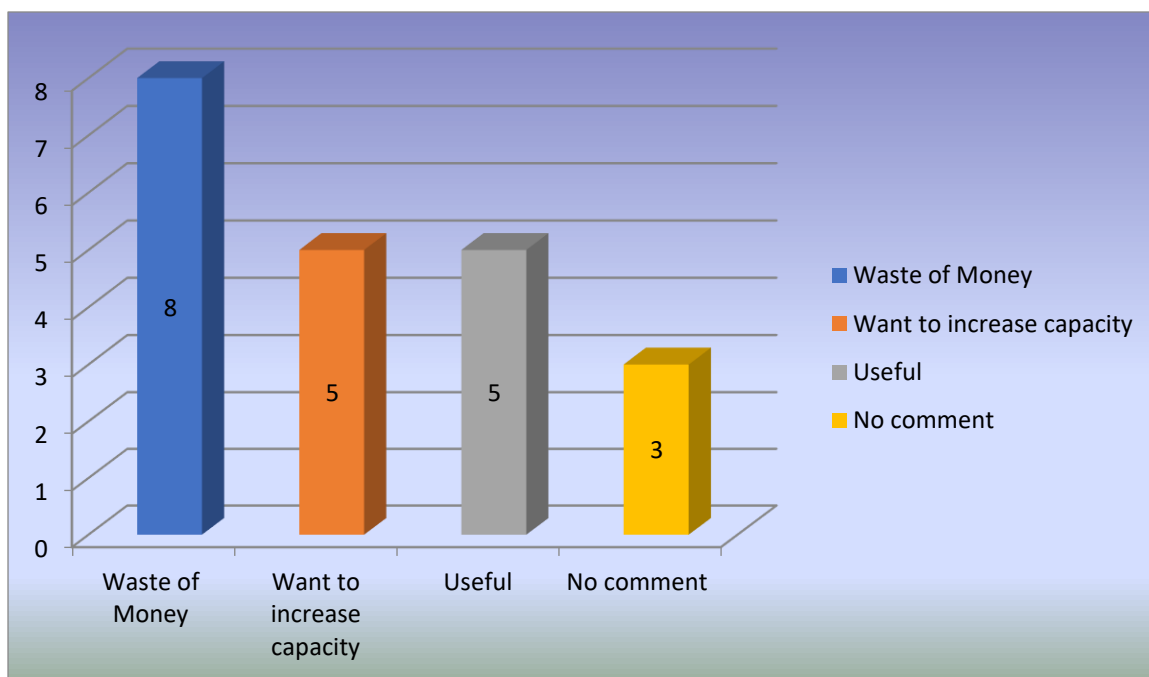


Fig4.6- Consumer Opinion

4.7 Facing any kinds of survey:

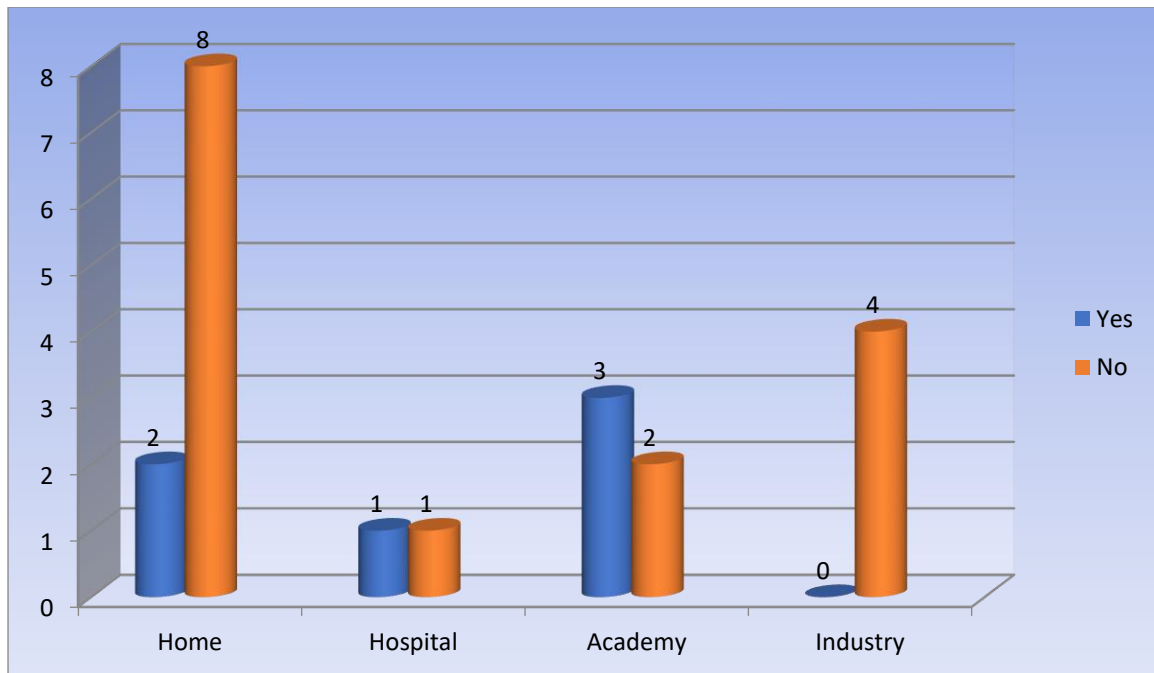


Fig 4.7-Facing any kinds of survey

Facing any kinds of survey chart of 4.6 describe a solar rooftop system .Total 10 consumer, 2 yes and 8 no of the result .Hospital 2 consumer, one consumer yes and one no of facing kinds of survey. Then academy total consumer of 5, yes of result 3 and 2 consumer answer of no. At the last industry area of total consumer of 4, every consumer is answer no.

4.8 Consumer satisfaction:

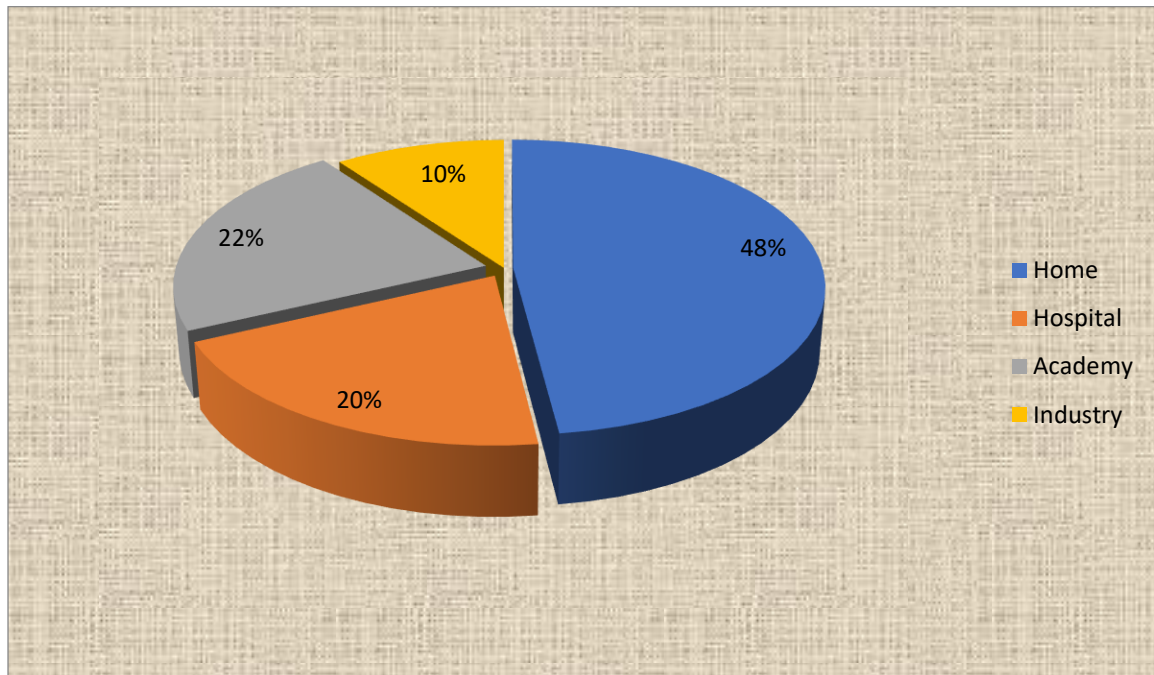


Fig 4.8- Consumer satisfaction

We visit narayangonj east and west zone some area of a solar rooftop system. We visit some locations (i.e. home, hospital, collage and basic industry area). All consumers some questions of solar rooftop system customer satisfaction home by 48%, hospital 20%, academy 22% and at last poor satisfaction of industry area consumer..

4.9 Thesis Finding:

We have find a new issue while we are on the field survey on consumer door to door. Some are theoretical some are technical.

4.9.1 Lack of Knowledge:

We have find a new issue while we are on the field survey on consumer door to door that most of the case most of the consumer don't have any interest to clean the solar panel on regular basis. Because when we ask them why you don't have any interested to make your valuable solar panel neat and clean? Then most of the consumers reply the same answer that first time they hear that SRS panel need to regular maintenance. Another problem is that currently Bangladesh is importing almost all types of solar panel. Due to policy obligation consumer don't want expense more money to buy a quality product instead to buy a low quality panel at low price.

4.9.2 Technical Issues:

After few days later they are facing many technical problem in that process they are losing their interest in using solar energy .More over information regarding use of solar energy not readily available in the market. Bangladesh government should take necessary steps to motivate the business persons as well as the rural people.

4.9.3 Government Initiative:

Most of the case when we ask the consumer did they get any financial/technical support like how to operate the SRS in a proper way. Then another part is maintenance which is very import part in SRS, if consumer don't get any short-training support from professional they will have face many difficulties. they said they don't get any support from government authority(in that case authority is DPDC). We know that gaining financial support is not possible from government authority(DPDC) for all consumer but if they wish they can easily arrange one/two day long Workshop about ‘‘ How to operate and maintenance of Solar Roof top System’’ at their local office/community.

4.9.4 Need to change Consumer/People unconscious mentality about SRS:

Most of the case when we asked the consumer that is this SRS is useful? Almost more than 90% consumer said that no because they don't get back their return (electricity from solar) to their huge investment on SRS within a sometime. We need to counsel them that if you want to get back the return (electricity from solar) on your investment then you have to clean your solar panel in a regular basis, you have to keep a log book for data about its daily production, your demand capacity, need to take solar electricity meter reading in a regular basis. Need to tell them that after fulfil this entire requirement you will be able to get back the return (solar electricity) regularly if they fail to do this they can't get proper amount of solar electricity insist of installed solar capacity. We need to tell them the advantage of renewable energy by help of electric print media and other way.

4.10 Recommendations:

It is shortsightedness to browse that star electricity is pricey. The higher initial value of capital of setting up SRS mustn't be taken as Associate in Nursing index of being dearly-won; rather the provisions to invest in alternative energy sources seem logical. As a result of most areas of the country still cannot access electricity, Associate in Nursing energy crisis might have ruinous effects on livelihoods. Recent studies by the globe organization and IBRD counsel the vulnerability of developing countries to activity. So alternative energy and alternative renewable energy sources allow the countries to rearrange future energy security nonetheless as prepare the country for the long haul effects of world global climate change. As Bangladesh is blessed with alternative energy, it's possible to secure energy crisis by adopting SRS technology. Mistreatment of star electricity will scale back to import high price of diesel and thereby save foreign currency. From the findings of the survey, the subsequent recommendations are going to be planned for the role of SRS thus on bringing property socio-economic development in Bangladesh.

In survey, it is found that, there is a considerable opportunity of Bangladesh to meet its future power demand and thus economic growth through renewable resources. Solar energy sources discussed above can help Bangladesh to produce more power in order to reduce Load-shedding problem. Time has come to look forward and work with these renewable energy fields to produce electricity rather than depending wholly on conventional method. Already

SRS established in our country. In survey, it's found that the quantity of SRS will increase the affordability by buying scheme in rural areas. The role of SRS on home financial gain is ascertained to be quite restricted, as SRS electricity is seldom used profitably. Lack of information on productive use of SRS and also the non-availability of star electrical appliances square measure found to be the most reasons for this example. In order to get rid of the impediments and increase effectiveness the SRS in geographic area following necessary actions is taken.

- ❖ Sustainable and Renewable Energy Development Authority ought to be additional active to popularize the star electricity in geographical region of Asian country.
- ❖ Appropriate money arrangements, as well as payment installments, fee for services, subsidy, technical and legal support for organizations dealing to line up within the star sector is critical.
- ❖ Government ought to foster analysis programs for harnessing, conversion and consumption alternative energy technologies. Demonstration program ought to be extended additional of numerous use of alternative energy technology.
- ❖ Technician coaching is crucial for developing native technical support, which may conjointly facilitate build the project property. Girls conjointly ought to be invited for coaching, as they're the most users of the systems and may do a number of the upkeep.
- ❖ Standard of alternative energy equipment ought to be ensured through establishment. To increase satisfactoriness of the technology by user components/accessories of star systems ought to be obtainable domestically so the users should purchase them simply once needed. To increase affordability native production of SRS parts is critical to cut back the damage of SRS.

CHAPTER- 5

CONCLUSIONS

5.1 Conclusion

The sun is a powerful source that can help our planet by giving us clean, reusable energy to power our world. The use of this energy is free, does not create pollution, and if used wisely can help us become less dependent on other more costly and damaging forms of power. After participating in this Web Quest I hope you are able to see the benefits of this valuable resource and help change the future for energy use, if solar electric power is to become an important source of energy in our future, the industry needs to work together in other to make it affordable for everyone, lowering costs.

We do survey East Zone 58 consumer and West Zone 28 consumer. So the total consumption of Narayanganj is 86. We almost collect all of the data. So the visit of East Zone is caesura 3, Fatulla 2, anayetnagar 3 and Amlapara 2. We almost collect all of the data. We do survey West Zone consumer. So the visit of West Zone is basic industrial area 4, Kashipur 2, mondolpara 3 and panchabati 2. We almost collect all of the data. In the area of Fatulla there are highest consumers in which ON Grid and In the area of Amlapara there are lower consumers in which ON Grid. In the area of Amlapara and Mondolpara there are the highest consumers in which OFF Grid and In the area of Panchabati there are no consumers in which OFF Grid. In the area of Fatulla there are the highest consumers in which Market in a bout of SRS. Therefore, most of the consumers are the Market in a bout of SRS. Therefore, most of the consumer solar panel is on in the operation of the SRS. In the area of housing there are highest consumers in which clean the solar panel .In the area of Industry there is lower consumers in which clean the solar panel. In the area of housing there are highest consumers in which Test the regular basis. In the area of industry, there are lower consumers in which Test the regular basis. Therefore, most of the consumers are no face any kind of survey. Therefore, most of the consumers are no check meter reading of SRS. Therefore, most of the consumers are no satisfaction of the SRS system.

5.2 Future Scopes of the work:

We do a survey of the solar roof top system (SRS) in Narayanganj after that next time survey of all Dhaka city in shaa Allah. With reduced costs and improved technologies, the solar energy ensures the reduced electricity bills, increases countries' energy security through reliance on an indigenous, inexhaustible resources, enhanced sustainability, reduced pollution, lower the costs of mitigating global warming, and keeps fossil fuel prices lower than otherwise. It is environment friendly and anyone can use it. The advantages are global. Hence, the additional costs of the incentives for early deployment should be considered learning investments; they must be wisely spent and need to be widely shared.

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