

A Thesis on

**“COST ANALYSIS OF SOLAR
ROOF TOP SYSTEM (SRS)
(UNDER DPDC)”**

Submitted By

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This thesis paper has been submitted to the Daffodil International University, of Bangladesh in partial fulfillment of the requirements of the degree of “Bachelor of Science in Electrical and Electronics Engineering.”

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APPROVAL

This Thesis titled “**FEASIBILITY ANALYSIS OF SOLAR ROOF TOP SYSTEM (SRS) (UNDER DPDC)**” submitted by **Md. Moniruzzaman Sarkar** to the Department of Electrical and Electronic Engineering, Daffodil International University, has been found as satisfactory and accepted for the partial fulfillment of the requirement for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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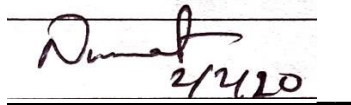
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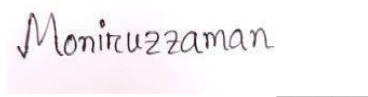
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Dedicated To

OUR PARENTS

&

TEACHERS

With Cordial Love & Respect

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ABSTRACTS

This research is an attempt to measure the impacts of Solar Rooftop Systems (SRS) in Bangladesh. After a brief review of previous research works on SRS's importance, benefits and prospect, the study mainly focuses on the issues of SRS's impacts on energy economics. Solar energy is one of the most popular form of renewable energy. The use of solar panel is increasing rapidly all over the world. Fortunately, the location of Bangladesh is quite suitable for harnessing solar energy. The object of Thesis was to analyze the feasibility of on grid connected Rooftop system in Narangonj under (DPDC). However, large area is still uncovered either by grid electricity or by electricity generated from renewable sources. Our work was to survey the consumers total SRS and collect some Questionaries' answers. We tried to know theirs SRS capacity, install cost, installation date and analyze the cost per unit energy. We wanted to convince them that in Bangladesh, where power generation is a huge challenge, solar rooftop system can play an important role. So, they should use the SRS in proper way

List of Abbreviations

AC	Alternative current
BD	Bangladesh
DPDC	Dhaka Power Distribution Company
HV	High Voltage
PC	Poly crystalline
PV	Photovoltaic
SRS	Solar Rooftop System
SAS	Stand-alone system
SHS	Solar Home System
CC	Charge Controller
CO₂	Carbon dioxide
LED	Light Emitting Diodes
DC	Direct Current
PGCB	Power Grid company of Bangladesh

Govt.	Government
ICT	Information and Communication Technology
KM	Kilometer
KWh	kilowatt hour
KVA	Kilo volt ampere
MVA	Mega volt ampere
MC	Mono crystalline
MW	Megawatt hour
NG	Narangonj
NGO	Non-Government Organization
UV	Ultraviolet
WD	Wave-guide Dispersion
WP	Watt Power

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Chapter 1

INTRODUCTION

1.1 Introduction

Bangladesh is a little over populated creating nation. In numerous remote districts of the nation, there is no supply of power. Country charge through solar PV innovation is getting increasingly prevalent, step by step in Bangladesh. Solar Home Systems are very decentralized and especially appropriate for remote, difficult to reach territories. In this manner in our nation the matter of solar power framework may practice with some legislature just as nongovernmental association. The likelihood of the customer base is high in our nation. Solar power plans are adjusting the vibe of country Bangladesh. What's more, it would be a billion dollar industry inside a couple of years. At present there are 32 associations doing solar vitality worry in Bangladesh. A housetop photovoltaic power station, or housetop PV framework, is a photovoltaic framework that gets its power producing solar boards went up along the housetop of a private or business development or development.

Solar vitality is the cleanest and most accessible sustainable power source. Sun powered power is the transformation of daylight into power either legitimately utilizing photovoltaic. It is a significant wellspring of sustainable power source and its advances are commonly described as either detached solar or dynamic sun powered relying upon the methods they seize and diffuse solar vitality or convert it into solar power. Dynamic sun powered procedures incorporate the utilization of Photovoltaic frameworks, concentrated solar power and sun powered water warming to bridle the imperativeness. Inactive solar procedures incorporate arranging a structure to the Sun, choosing materials with great warm mass or light dissipating properties, and planning spaces that normally flow air. Housetop sun powered is progressively savvy for property holders, business owners, and their networks. Decreases in innovation costs, inventive financing, and developing systems of solar installers and money related accomplices all helped push down the costs for family unit framework by 45% percent from 2010 to 2014. In summation, a government solar venture duty credit returns 30 percent of that price tag, and state and nearby assessment credits, refunds, and other help in driving nations would then be able to disregard the all-out fiscal worth as yet further. Dropping costs are because of economies of scale and specialized upgrades. The diminishing expense of housetop PV frameworks results from advances in the innovation and economies of scale among producers. Overall solar board generation (for housetop and other markets) expanded from 24,000 megawatts (MW) in 2010 to 40,000 MW in 2014. PV costs in the

United States are in like manner moved by overall economic situations, including the rise of lower-evaluated solar items from China. PV expenses have likewise profited by decreases in "delicate" costs, for example, those connected to deals, allowing, assessment, association with the power framework, and the net revenues of retailers and installers. These decreases are expected to some degree to bigger volumes and groupings of framework establishments just as nearby offices streamlining allowing forms and any network guided endeavors to pool neighborhood property holder interest for solar.



Figure 1.1: Solar rooftop system

1.2 Problem Statement of Solar System in Bangladesh

There is some issue for utilizing solar. There has not been an effect on solar in Bangladesh. The general population of BD don't realize which kind of sun powered is best for produce power. They purchase low sort solar in a market which isn't truly sturdy, that reason solar not give much vitality. They don't have the foggiest idea how to utilize it and how to clean it. Accordingly, it is getting harmed in all respects rapidly. They are not ready to utilize it on the grounds that there is nothing more than trouble quality mentor, which is making it breakdown in a brief timeframe. The most concerning issue is that in numerous towns Solar has not yet contacted. Numerous individuals think about Solar yet can't buy it because of absence of cash. On the off chance that our administration make some stride for this, our kin introduced it easily

1.3 Objective

- ❖ The target of our work is to dissect the attainability of solar housetop framework
- ❖ To find the potential results with respect to solar vitality frameworks in our Country just as the issues in regards to the business
- ❖ To contrast hypothetical Knowledge and the handy work nearby with watching various pieces of close planetary system.
- ❖ To quantify the job of SRS on financial improvement in Banglades
- ❖ To build up some handy proposals for improving access to SRS in regions where a satisfactory power supply is obliged
- ❖ To gather information about customer suppositions and that particular area
- ❖ To improve the quality and administrations of close planetary system.
- ❖ To compute the per unit cost of solar power from the data of the close planetary system.
- ❖ To plan the thought regarding how much power the shopper jumps on a normal and in which reason it is being utilized.

1.4 Scopes

Bangladesh is broadly known as a tropical nation has a tremendous measure of solar vitality. In any case, it is regularly scrutinized that the amount of the solar vitality is being utilized appropriately. Along these lines, the underlying advance was to extend the extent of our examination. No minimized examination is unusually found for the prospect and extent of solar power for the monetary improvement in rustic territories of Bangladesh. It is discovered that the rustic zone has a minor information on the financial effect of solar power. Along these lines, this report will potentially cover the information about sustainable power source nearby planetary group moreover with Solar housetop home framework, activity of the framework, on lattice and off-matrix framework, world solar vitality introduced limit, convenience of solar home framework, prospects of close planetary system in Bangladesh, Solar board, Batteries, Charge Controller Power Inverter, Backup Generator, Power Meter, Kilowatt Meter. Additionally, it will likewise help with new innovation move in rustic regions. This incorporates business specialized manuals and building information relating to their specific home housetop solar board.

1.5 Thesis outline

Chapter 1 Introduction.

Chapter 2 Describes Literature Reviews.

Chapter 3 Describes Methodology.

Chapter 4 Describes Result.

Chapter 5 Describes Conclusion sector of the Thesis.

Chapter 2

LITERATURE REVIEWS

2.1 Introduction

In this section we've portrayed Energy, Renewable Energy, Non-sustainable power source, Advantage and Disadvantage of Renewable and Nonrenewable Energy, Solar Energy, World Solar Energy, for example, China solar Power, Indian Solar Power, likewise Bangladesh Solar Energy, Grid, Mini Grid of Bangladesh, Roof Top Solar Home System, and Solar System Installment.

2.2 Energy

As per the material science, vitality is the limit with regards to doing work which requires during the time spent exchange starting with one framework then onto the next. The normal image for vitality is the capitalized letter E. It for the most part exists in potential, active, warm, electrical, substance, atomic, or other a few structures too. Electrical Energy is known as the most prominent type of vitality. Electrical vitality characterizes a type of vitality that outcomes from the progression of electric charge. The stance of charged particles through a wire or other medium is entitled as flow or power. Electrical vitality can be fundamentally characterized into two sorts, inexhaustible and nonrenewable vitality.

2.3 Renewable energy

Sustainable power source frequently alluded to as spotless vitality, these vitality originates from normal sources that are continually renewed. For instance, daylight or wind continue sparkling and blowing if their accessibility relies upon time and climate. There are Five sorts of Renewable vitality they are

- ❖ Solar Energy
- ❖ Biomass Energy
- ❖ Wind Energy
- ❖ Hydropower
- ❖ Geothermal

2.3.1 Solar Energy

Mankind have been equipping solar essentialness for an enormous number of years—to create crops, stay warm, and dry sustenance's. Yielding to the National Renewable Energy Laboratory,

"more life from the sun falls on the ground in one hour than is used by everyone known to mankind in one year." Today, we use the sun's shafts from different viewpoints—to warm homes and associations, to warm water, or power devices. Sun controlled, or photovoltaic (PV), cells are delivered utilizing silicon or various materials that change sunshine explicitly into power. Circled universes make control locally for homes and associations, either through rooftop sheets or system broadens that control entire neighborhoods. Sun situated farms can get drive for a colossal number of families, using mirrors to think sunlight transversely over areas of place that is known for sun arranged cells. Drifting solar farms—or "photovoltaic"— can be a capable utilization of wastewater workplaces and conduits that aren't normally fragile. Sun arranged supplies to some degree more than 1 percent of U.S. power age. In any case, about 33% of all new making point of confinement started from sun controlled in 2017, second just to vaporous petroleum. Sun controlled essentialness systems don't make air pollutions or ozone exhausting substances, and as long as they are proficiently sited, most sun situated sheets have less regular impacts past the creation task.



Figure: 2.1: Bangladesh's largest solar power plant in teknafs.

2.3.2 Biomass Energy

The utilization of bio energy is partitioned into two significant classes: "regular" and "present day". Customary use alludes to the burning of biomass in administration comprehensive of timber, creature waste and regular charcoal. Present day bioenergy advances incorporate fluid biofuels produced using bagasse and different plants; bio-processing plants; biogas delivered through anaerobic absorption of waste; warming frameworks for wooden pellets; and various innovations. Around 3 fourth of the use of sustainable power source inside the worldwide include bioenergy, and extra than half of the regular utilization of biomass has a vital ability to blast vitality substances in universal areas with developing interest, for example, brazil, India and china. It very well may be singed on the double for warming or power age, or it could be changed into oil or fuel substitutes. Fluid biofuels, a helpful sustainable option for gas, are particularly utilized inside the transportation district. Brazil is the boss in fluid biofuels and has the greatest armada of adaptable fuel autos, which could keep running on bioethanol liquor made chiefly through the maturation of sugars in sugar or starch vegetation, comprehensive of corn, sugarcane or treat sorghum.

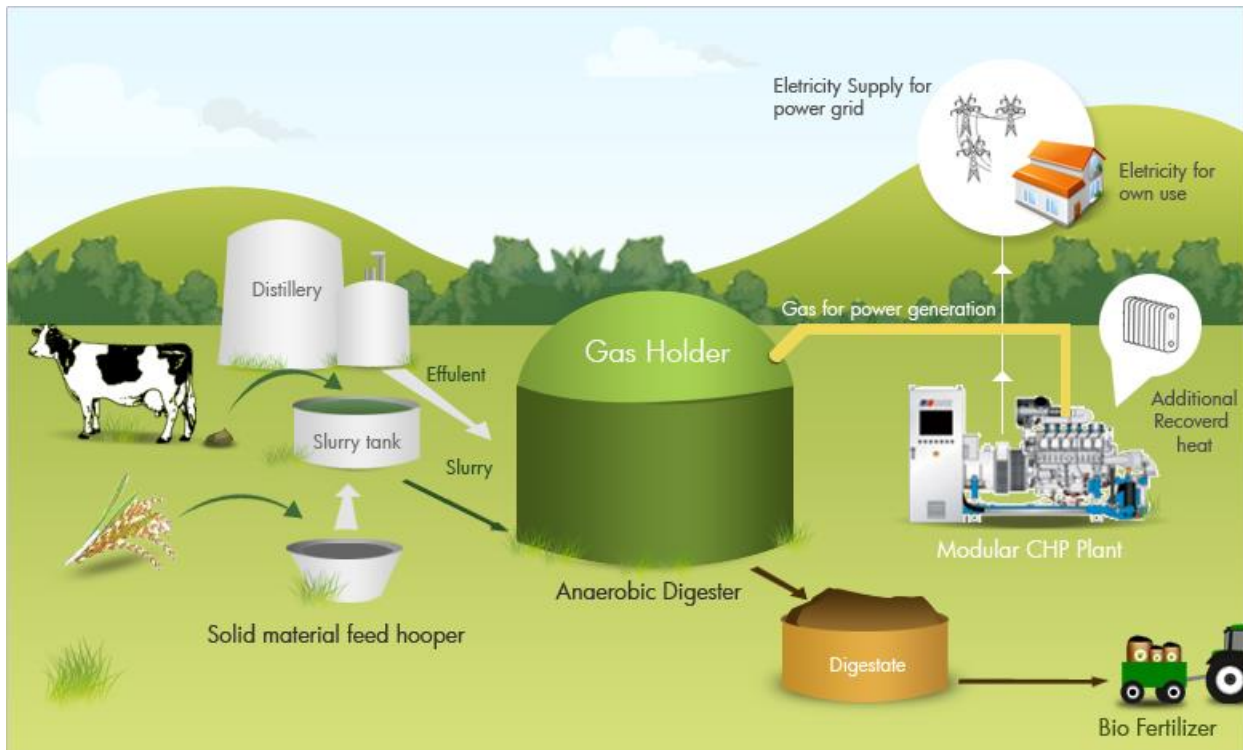


Figure 2.2: Biomass Energy.

2.3.3 Wind Energy

Wind vitality or wind power can be portrayed inside a procedure by which wind is utilized to create power. The Wind turbine changes over the dynamic vitality from the breeze into mechanical power. The vitality in the breeze twists a few propeller-like sharp edges around a rotor. The rotor is associated with the fundamental shaft. A generator changes over mechanical power into power.



Figure 2.3: Wind farm at puratan shanti bazar in cox's bazar kutubdia island

Geothermal

2.4 Non-Renewable Energy

A large portion of the energy consumed in the United States is from nonrenewable vitality sources

- ❖ Petroleum products
- ❖ Hydrocarbon gas liquids
- ❖ Natural gas
- ❖ Coal
- ❖ Nuclear energy [1]

2.5 Renewable Energy Scenario of Bangladesh

Successful use of feasible power source resources in Bangladesh by and by can't get business estimations and can't fill in as a choice rather than customary imperativeness resources. Regardless, they can serve to improve the whole deal imperativeness needs of Bangladesh to a basic measurement. Handling these advantages offers off an impression of being a promising response for improving the individual fulfillment of common residents. Arrangements of feasible power source that are being used in limited courses in the country are hydro-, solar and wind control, bio-gas, and biomass, for instance, wood, rice husks, etc. The present idea of feasible power source is around 6%. At present, the national furthest reaches of practical power source based power, except for hydro-control, is approx. 50 MW as showed up in Table 2. Little scale hydro and littler than ordinary hydro, in any case, have obliged potential in Bangladesh.

Category	Generation
SHS 45 MW	45 MW
Other solar PV application	1 MW
Wind Energy	2 MW
Biomass based electricity	<1 MW
Biogas based electricity	1 MW
Total	50 MW

Table 2.1 Renewable Energy Scenario of Bangladesh

Contemplating the fuel crisis, and examining new, safe, and supportable essentialness resources, the organization has figured out how to propel imperativeness insurance and the usage of limitless sources. Assembly of Bangladesh announced the Renewable Energy Policy, fundamentally since 2009 (MEMR, 2008). As shown by this procedure, the governing body is centered around empowering both open and private region enthusiasm for practical power source endeavors to scale up duties of existing supportable power source based power age.

2.5.1 Solar system

There is a solid prospect of housetop framework associated solar power age. The positive side of rooftop top solar is that it spares the arable land. This segment is sitting tight for the 'feed-in tax' approach from the legislature. In this plan the utility expert, the Power Development Board should purchase control at a superior cost from qualified rooftop top makers. Subsequently, the proprietors of structures and ventures will be spurred to introduce solar boards on the rooftop to sustain power to the national matrix and win a profitable side salary. A genuine case of this is Germany where the rooftop top solar units under 'feed in levy' approach made a noteworthy commitment to the solar power age. These units are essentially little between 10kW to 100 kW and will confront a test to associate with the current network. The region close to the substations will be reasonable to start this program for simple network association. An aggregate methodology can furnish with a decent outcome. It is conceivable that the certified structures in the region of the substations can be gathered inside a system. There are some NGO's, for example, IDCOL, Grameen Shakti, Rahimafrooz and Energypac which are approaching to advance the solar innovation for power age. In SHS, PV board is utilized to create power. The motivation behind propelling SHS in Bangladesh was to guarantee power access to off-lattice provincial individuals. Bangladesh has made gigantic progress in SHS. Up to now, the absolute number of introduced SHS is 5.2 million with 218.48 MW limits. Framework Development Company Limited (IDCOL) has been a noteworthy contributing organization which introduced 4.5 million SHS out of all out 5.2 million SHS. The other 0.7 million SHS was essentially introduced by Bangladesh Rural Electrification Board (BREB), German Organization for Technical Cooperation (GIZ).Foundation Development Company Limited (TR/KABIKHA venture). The expanding pattern of SHS establishment of the most recent seven years is appeared in the figure. It is seen that from the year 2011 to2017 the quantity of SHS expands multiple occasions. Additionally, the quantity of SHS establishment over the most recent five years is 3.3 million that has brought very nearly 150 million individuals into access to power.

2.6 Definition of Solar Power

Daylight based essentialness is the cleanest and most available maintainable power source. Sun situated power is the change of sunlight into power either explicitly using photovoltaic. It is a fundamental wellspring of reasonable power source and its advances are generally portrayed as

either segregated solar or dynamic daylight put together depending with respect to the strategies they seize and diffuse sun fueled imperativeness or convert it into sun arranged power. Dynamic daylight based procedures fuse the use of Photovoltaic structures, concentrated sun arranged power and solar water warming to furnish the vitality. Uninvolved daylight based techniques consolidate arranging an attempting to the Sun, picking materials with extraordinary warm mass or light dispersing properties, and arranging spaces that ordinarily stream air.

2.7 The History of Solar Power

The historical backdrop of photovoltaic vitality started in 1876. William Grylls Adams, together with an understudy of his, Richard Day, found that when selenium was presented to light, it created power. A specialist in power, Werner von Siemens, pronounced that the disclosure was "experimentally of the best significance". The selenium cells were not productive, yet it was demonstrated that light, without warmth or moving parts, could be changed over into power. In 1953, Calvin Fuller, Gerald Pearson and Daryl Chapin found the silicon solar cell. This cell really created enough power and was proficient enough to run little electrical gadgets. The New York Times proclaimed that this revelation was "the start of another time, which in the long run prompted the acknowledgment of bridling the practically boundless vitality of the sun for the employments of human progress. "It is 1956, and the principal solar cells are economically accessible. Be that as it may, the expense is out of sight go after conventional individuals. At \$ 300 for a 1-watt solar cell, the cost was well over everybody's methods. 1956 started to demonstrate to us the primary solar cells utilized in toys and radios. These oddity things were the first to have sun powered cells accessible to shoppers. In the late 1950s and mid-1960s, satellites in the US space program. UU and the Soviet Union was fueled by sun powered cells and, before the part of the bargain, solar vitality was essentially the standard for bolstering satellites to space. In the mid-1970s, an approach to lessen the expense of sun powered cells was found. This made the cost go down from \$ 100 for every watt to around \$ 20 for each watt. This examination was going by Exxon. A large portion of the seaward oil apparatuses utilized solar cells to control the decreasing lights over the stages. The period from the 1970s to the 1990s saw an impressive change in the utilization of solar cells. They started to show up at railroad intersections, in remote spots to bolster homes, Australia utilized sun powered cells in their microwave towers to grow their broadcast communications abilities. Indeed, even the desert areas saw that sun powered vitality carried water

to the ground where power encouraged by lines was impossible! Today we see solar cells in an assortment of spots. You can see solar controlled autos. There is even a solar controlled plane that has flown higher than some other plane except for the Blackbird. With the expense of solar cells inside everybody's spending limit, solar vitality has never been so enticing. As of late, the new innovation has given us solar cells with screen printing and a solar texture that can be utilized to beautify a house, including solar tiles that are introduced on our rooftops. Global markets have opened up and solar board producers are assuming a key job in the solar vitality industry.

2.8 Use of Solar Power

The essential creators of the world's vitality age are the non-renewable energy sources (oil, oil, coal) and atomic power plants. Referable to the utilization of petroleum derivatives, ozone harming substances (CFC, CH₄, O₃ but for the most part Co₂) produce into the air. From the atomic power plant, carbon is discharged in a little amount (90 grams likeness carbon dioxide per kilowatt hour), [I] But the radioactive waste stays dynamic over those and years which is a conceivable wellspring of natural defilement. The number of SHS installation reached 6.8 million in 2018, which provides electricity in the remote areas through off-grid power services.[2]

Natural sources of carbon dioxide

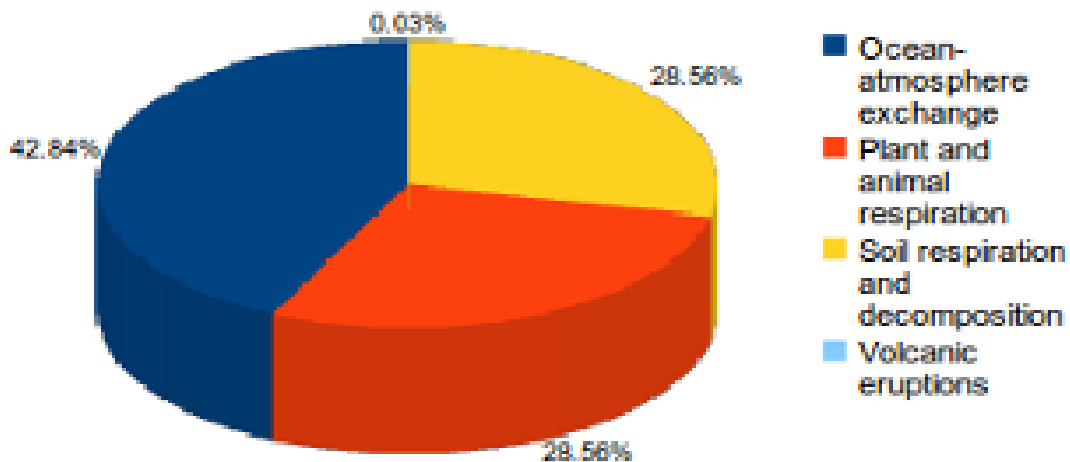


Figure 2.4: source of carbon dioxide emission

Shape 8 demonstrates that power age is the wellspring of the most astounding emanation of carbon dioxide. Along these lines, generation of this perfect vitality is really driving the most noteworthy towards a worldwide temperature alteration. A dangerous atmospheric deviation and additionally the natural contamination is, in our occasions, the best ecological risk to human presence. Then again, in that regard is a disturbing vitality emergency worldwide as non-renewable energy source holds diminish and the maturing power plants will close down sooner rather than later.

From the possibility of a worldwide temperature alteration and lack of petroleum gas, researchers and technologists are searching for new, sustainable power sources. Solar vitality is the extraordinary compared to other decisions. Since the earth gets 3.8 YJ [IYJ1024 J] of vitality which is multiple times heavier than the universes utilization of products and enterprises. [3] Bangladesh is confronting an exceptional shortfall of vitality. Petroleum gas is the foremost wellspring of necessities of both local prerequisites and modern and business requests,

Particularly requests for power age for long. Our present power age limit is only around 4200 MW though the aggregate power necessity is 6000 MW. [4] So, we can get just 70% of our whole power require. Because of this shortage of power not just we are confronting load shedding the nation over, yet in addition the modern area is seriously influenced. Bringing about decreased mechanical yield and lessened fare income. Thither is a developing interest on the vitality area for quick industrialization, urbanization, high populace increment, expanding sustenance creation, rising way of life, and so forth. Solar vitality could be a noteworthy base of intensity age in Bangladesh. Bangladesh government intends to make it mandatory to put in solar board on housetops of each multistoried and hello there rise building. As solar vitality is one of the cleanest and least complex sorts of imperativeness, we can want to see. Solar vitality is promptly accessible anyplace and wherever on the planet. It very well may be utilized it to produce power at the dimension of utilization.

2.9 Potential of Solar Energy

The year 2008 was 474 exajoule (IEJ-1018 J) or roughly 15TW (1.504*10¹³ W). [II] Almost 80%-90% of this vitality originated from petroleum product. [12] From the sun, earth gets 3,850,000 EJ of essentialness here is a monster capacity of solar imperativeness. It is massive to the point that the entire imperativeness needs of the whole globe can be met by the sun situated

essentialness. The total imperativeness usage of the whole world in.[11] which is relative to 174 peat watts (1 PW-1015 W). The world does not have all the essentialness, a bit of it reflects back. After reflection earth gets 89 PW of essentialness. Of this enormous aggregate just shy of 0.021% are adequate to replace the oil based good and nuclear power supply in the whole universe at present. By this we can without a lot of a stretch see the enormous ability of sun situated imperativeness. Contemplating nursery sway, other environmental impact, cost, risk and availability, sun fueled essentialness has the best potential among all the imperativeness sources.

Sun arranged power gets splendid light and warmth from the sun and changes over it into clean essentialness that can be utilized to control homes, associations and equipment. This reasonable power source, first used financially more than 100 years earlier, is growing rapidly as people scan for origins of imperativeness that are supportable and earth sound both in mechanical nations like the United States and immature countries that need to control improvement. In fact, sun arranged power is predicted to wrap up the world's most essential wellspring of intensity by 2050, according to the International Energy Agency. Get a drive through Southern California or various countries that get a better than average course of action of sunshine and you will experience how common daylight-based power is. On any noteworthy road, you will unmistakably get houses, ceasing structures, schools, roadway signs, and stores that have added sun-based sheets to outfit sun fueled essentialness for electrical mechanical assemblies, cooling, lighting, water warmers and various limits. Likewise, progressively sun fueled sheets separate each day as people grasp the cost-capability and sensible nature of daylight-based essentialness. Solar imperativeness is trustworthy and convincing, making power in the midst of zenith periods — hot nighttime's — when the intrigue is high and constrained air frameworks are racing to the maximum. Along essential lanes, the sun's imperativeness is gotten in the midst of the daytime to enable freeway signs to shimmer during the night.

2.10.1 Classification of Solar Cell

With the rising prerequisite for daylight based power new developments are being exhibited and existing advances are creating. There are four cases of daylight based PV cells

- ❖ Single crystalline or mono crystalline
- ❖ Multi- or poly-crystalline
- ❖ Thin film

❖ Amorphous silicon

Single-crystalline or mono crystalline: It is commonly open and the best cells materials among all. They get the most power per square foot of module. Each cell is cut from a lone valuable stone. The wafers by then furthermore cut into the kind of rectangular cells to grow the amount of PDAs in the daylight based board.

Polycrystalline cells: They are drawn from similar silicon material except for that instead of being made into a single valuable stone, they are relaxed and filled a cast. This shape is a solid shut that can be work out into square wafers with less waste or material than round single-pearl wafers.

Thin film panels: It is the most present development familiar with daylight based cell planning. Copper indium discipline, cadmium Telluride, and gallium arsenide are a meager film material. They are immediately put away on glass, solidified steel, or other great substrate materials, entirely quite a bit of them show improvement over crystalline modules under low lighting up conditions. A slight film is certifiable weak two or three micrometers or less.

Amorphous Silicon: Formless silicon is most state-of-the-art in the dainty film structuring. In this development, unclear silicon vapor is saved money on a few micrometer thick shapeless films on solidified steel rollers. [2] Compared to the crystalline silicon, this innovation utilizes just 1% of the stuff. Table below shows the efficiency of different types of solar cell

Cell type	Efficiency, %
Mono crystalline	12-18
Polycrystalline	12-18
Thin film	8-10
Amorphous silicon	6-8

Table: 2.2 Efficiency of different types of solar cell.

2.11 Solar panel

Photovoltaic modules utilize the light vitality of the sun to create power through the photovoltaic impact. Normal modules utilize crystalline silicon cells dependent on wafers or dainty film cells. The basic individual from a module can be the top layer or the back layer. Cells should likewise be ensured against mechanical harm and dampness. Most modules are inflexible, however semi-adaptable cells dependent on flimsy film cells are likewise accessible. The phones must be associated electrically in arrangement, one to the next. A photovoltaic association box is associated with the back of the sun powered board and is its yield interface. Most photovoltaic modules use MC4 type connectors to encourage weatherproof associations with the remainder of the framework. Furthermore, a USB control interface can be utilized. The electrical associations of the module are made in arrangement to arrive at the ideal yield voltage or in parallel to give an ideal flow limit. Lead wires that expel the current from the modules may contain silver, copper or other non-attractive conductive progress metals. The bypass diodes can be incorporated or used externally, in case of partial shading of the module, to maximize the output of the still illuminated module sections. Some special photovoltaic solar modules include concentrators in which light is focused by lenses or mirrors in smaller cells [3].

2.12 Charge Controller

A solar charge controller deals with the power going into the battery bank from the solar cluster. It guarantees that the profound cycle batteries are not cheated amid the light, and that the power doesn't work in reverse to the solar boards medium-term and run out the batteries. Some accuse controllers are accessible of additional abilities, such as lighting and load control, just regulating the power is its principle occupation. A sun powered charge controller is accessible in two unique innovations, PWM and MPPT. How they perform in a structure is very not quite the same as each other. A MPPT charge controller is more exorbitant than a PWM charge controller, and normally defended, in spite of all the issue to reimburse the additional money.

WIRING SEQUENCE



Figure 2.5: Charge controller

2.13 Batteries

At any rate two electrochemical cells related in a plan which store substance essentialness and make it available as electrical imperativeness. Batteries can be resuscitated when the invention reactions are reversible; they are stimulated by running a charging current through the battery anyway the other method for the discharge current. There are various sorts of electrochemical cells; the standard wet lead-destructive, the progressed fixed lead-destructive and the dry-cell like lithium-ion(Li-particle) are the most broadly perceived. Further characteristics move as a result of various components including inward science, current drain, and temperature. The battery choice depends insistently on its application, condition, and prize.



Figure 2.6: Battery

2.14 Inverter

Solar board creates DC power, however the vast majority of the family unit and mechanical machines require Ac current. The inverter changes the DC current board or battery to the AC current. [4]

They are two part in inverter

- ❖ Stand alone and
- ❖ Line-tied or utility-interactive



Figure 2.7: Inverter:

2.15 Block Diagram of Solar System

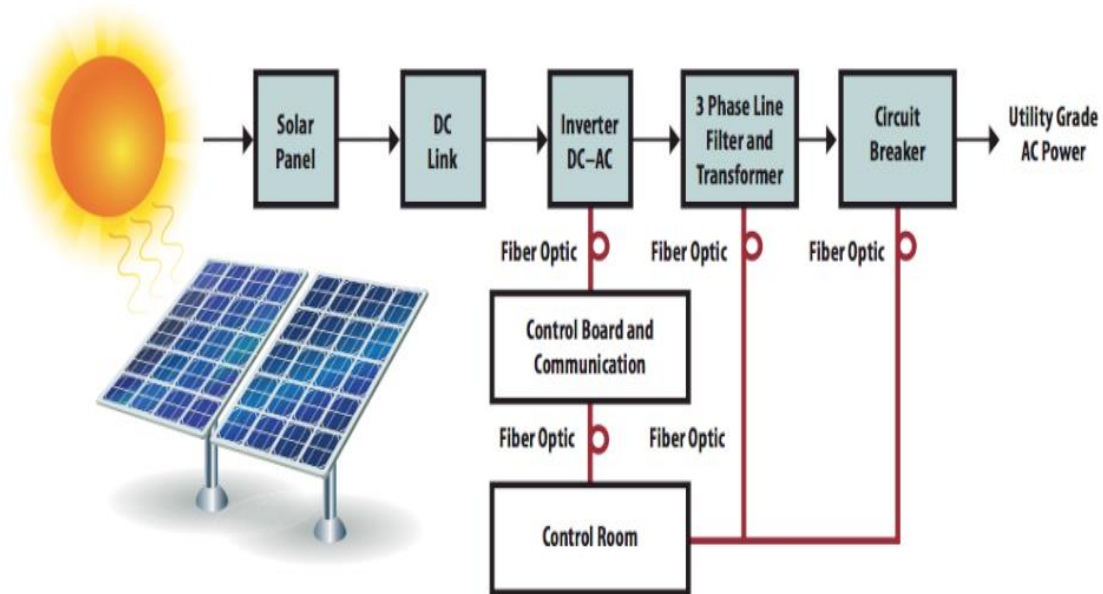


Figure 2.8: block diagram of solar system

2.16 Types of Solar System Design

There can be different kinds of close planetary system structure. Yet, there are three essential structures Consideration, they are-

1. Off-grid
2. On Grid
3. Stand lone

2.17 OFF-Grid System

These approaches enable you to store your daylight based power batteries for use when the power grid goes down or in case you are not on the turf. Cross breed systems offer ability to adjust the lattice control at whatever point the sun is shimmering and will even send bounty ability to the system for credit for later use.

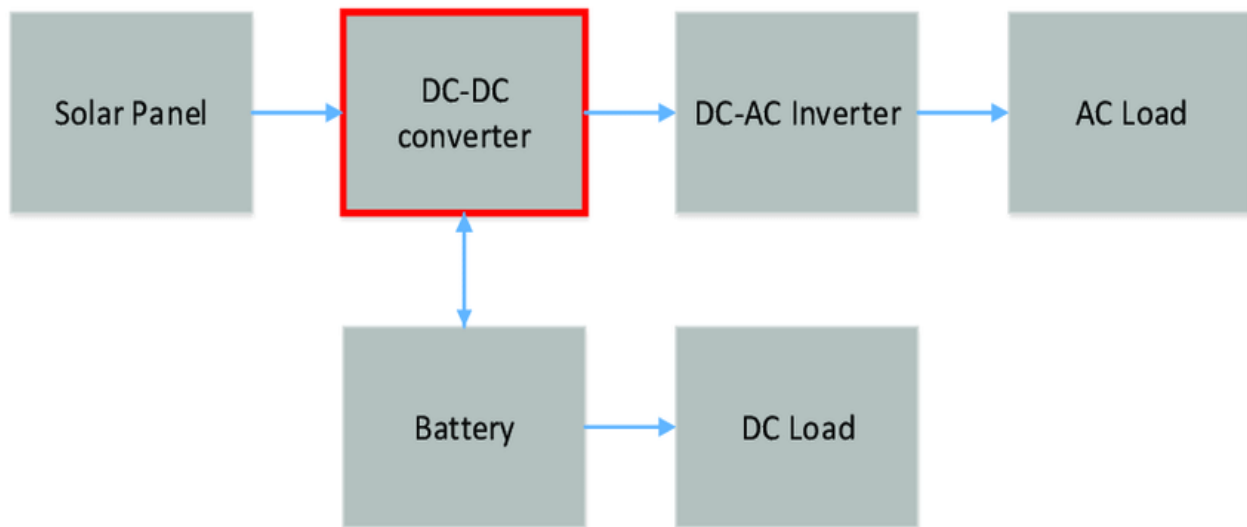


Figure 2.9: block diagram of solar off grid system

2.17.1 Benefits

Offers ability to essential weights when the power system is down.

2.16.2 Downside: Can't be required to supply control for all of your piles since the expense and principle some portion of batteries would be prohibitory. Off-system structures require altogether progressively focused rigging to work that is even more extravagant and dynamically complex to place in. Specifically, they need a key/string inverter, a charge controller and furthermore batteries. Evaluating the sun fueled group and the batteries required is stunning. Unmistakable examination of your fundamental will be required to offer for your irrelevant essential needs. You'll also need to upgrade your guideline electrical control board to keep isolated the "fundamental weights" with the objective that just they give control in a power outage. This plans you're well siphon, cooler and several lights are given power while your atmosphere control frameworks and TV and other superfluous weights are certainly not. This is unequivocally not a home loan holder installable structure. Presenting it is both certifiable and complex. In like manner, batteries are expensive, require persistent upkeep and irregular substitution. Passed on the additional particular apparatus included and the manner in which that it requires ace foundation,

anticipate that an off structure should cost four times as a great deal to acquaint per watt and with call for consistent upkeep employments.

2.18 ON- Grid System

Definition: On-Grid Systems are solar PV frameworks that just produce control when the utility power lattice is accessible. They should identify with the lattice to work. They can send additional power produced back to the matrix when you are overproducing so you credit it for later utilization.

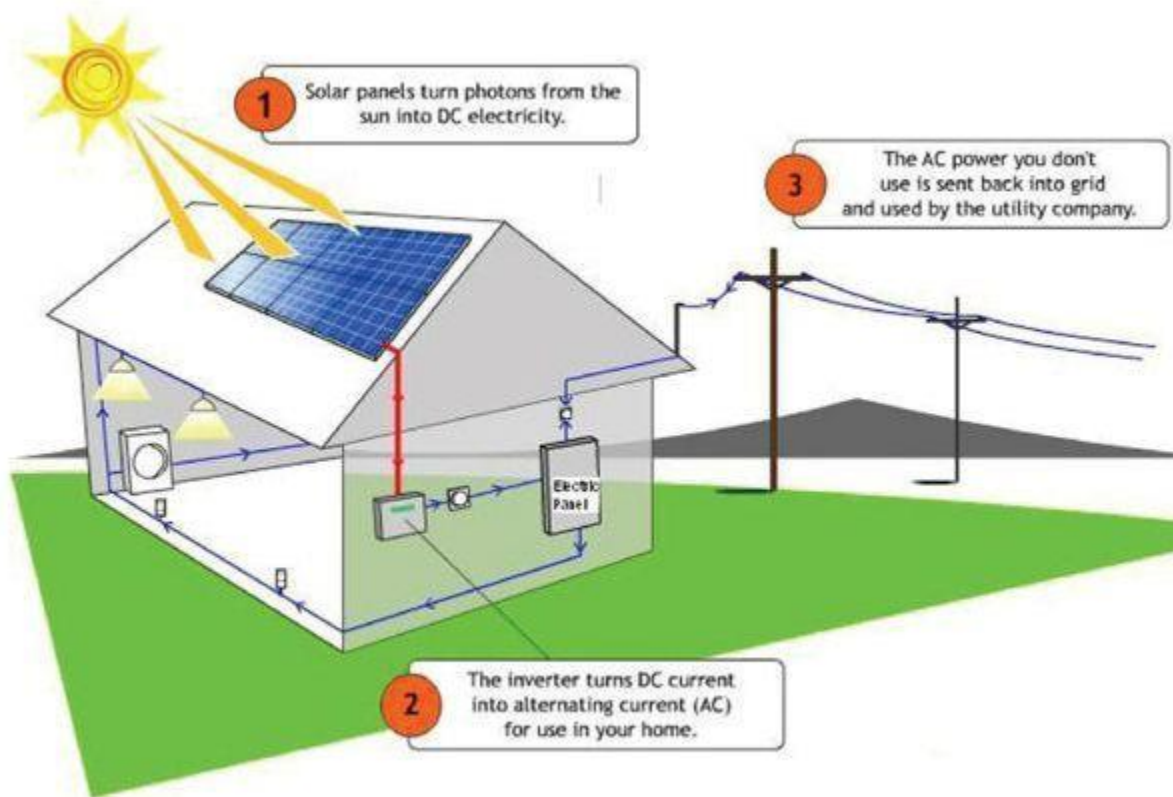


Figure 2.10: solar on grid system

Benefits: These are less troublesome structures and the most cost capable to place in. These affiliations will compensate for themselves by adjusting administration charges in 3-8 years.

Downside: These don't give control in the midst of a system power outage.

2.19 Stand Alone System

Autonomous PV systems are needed to run free of the electric utility power structure, and are normally arranged and estimated to supply express DC and moreover AC electrical weights. Autonomous sun situated PV structures can be continued running with or without batteries.

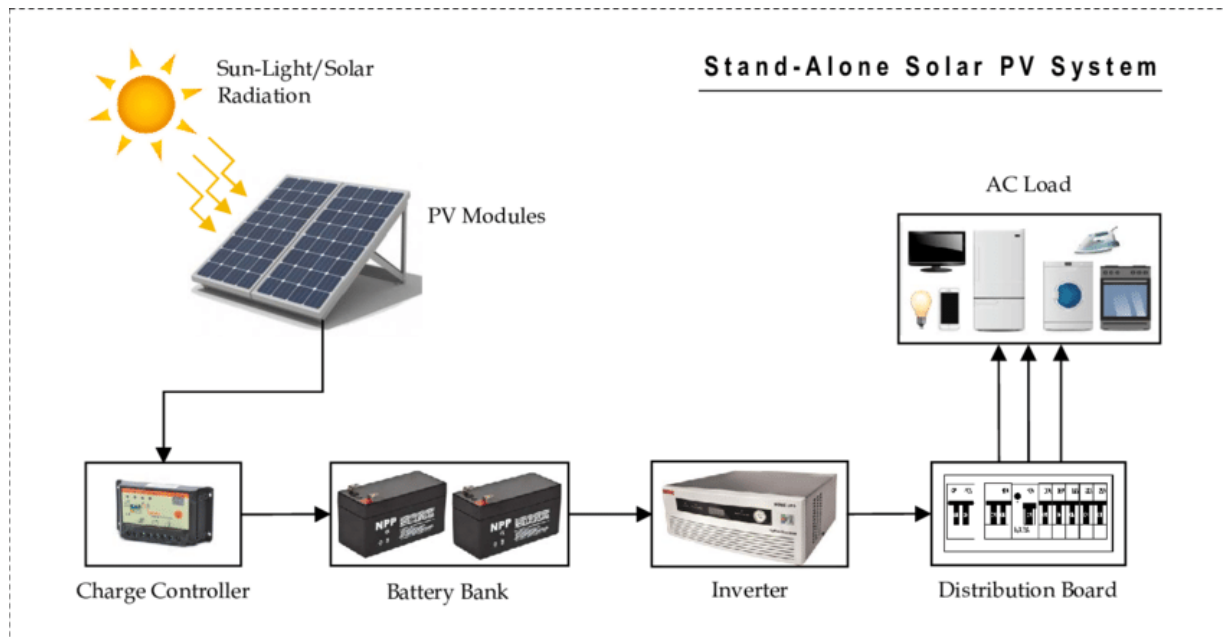


Figure 2.11: stand Alone system

The two cases of stay single photovoltaic power structures are quick - coupled system without batteries and stay lone system with batteries.

2.19.1 Direct-Coupled System

The two occasions of stay singular photovoltaic power systems are quick - coupled structure without batteries and stay single system with batteries.

The key model of a direct coupled structure involves a sun fueled board related explicitly to a DC stack. So also there are no battery banks in this arrangement, push isn't taken care of and along these lines it is fit for controlling ordinary mechanical assemblies like fans, siphons, etc just in the midst of the daytime. MPPTS are ordinarily associated with profitably utilize the Sun's imperativeness, especially for electrical weights like positive - movement water siphons. Impedance planning is also seen as an arrangement standard in direct-coupled systems.

2.19.2 Stand-Alone System with Batteries

Schematic of an autonomous PV system with battery and charger. In stand-alone photovoltaic power structures, the electrical essentialness made by the photovoltaic sheets can't by and large be associated immediately. As the enthusiasm from the payload doesn't always square with the sun situated board limit, battery banks are generally used. The guideline employments of a limit battery in a free PV structure are:

- ❖ Energy Storage Capacity and Autonomy: To store essentialness when there is an excess is available and to give it when asked.
- ❖ Voltage and Current Stabilization: To give stable current and voltage by executing wanderers.
- ❖ Supply Surge Currents: to give flood flows to loads like engines when required

2.20 Operating of Principle of Solar Energy

Solar power and sun situated sheets are tolerating a ton of thought as an element of the answer for our imperativeness crisis. Sun fueled imperativeness, moreover called photovoltaic essentialness, is encountering fast changes on account of monstrous enthusiasm for creative work.

Solar Cell

A solar board is built of a few photovoltaic cells. The work spaces are extremely slight, around 1/100th of an inch thick and typically 3 to 4 inches square. These cells convert daylight into vitality by the photovoltaic impact (we will discuss this issue in detail in a later article). These phones don't require fuel and have a standard lifetime of 20-30 years

Solar Panels & Modules

Photovoltaic (PV) cells are gathered to convey a sun situated module. The module is what you are habituated to seeing as a jury. It has some place in the scope of 2 to 200 cells gathered together, encased in security glass and aluminum to make them water repellent.

Tying Them Together

Like batteries, telephones can be solidified in consecutive dispersion or in parallel to make more prominent and logically express voltages and amperages. For instance, four 1-volt/1-amp cells in

successive creation will join for 4 volts, yet the amperage will stay at 1 ampere. Then again, four 1-volt/1-amp cells in parallel will keep up 1 volt anyway have 4 amps of yield. You can expand the amperage by the electrical power (in the point of reference more than, 4×1) to get the watts made. A watt is a measure of imperativeness (consider a 40-watt light).

Sizes and Shapes

Modules can be worked in a various sizes and shapes to suit their application. Sheets come in standard rectangular, triangular, foldable, and even flimsy film rolls. This recommends they can be associated in a wide mix of employments, from watercrafts and rvs to electric cars and space stations.

The Solar Array

Modules are joined to convey daylight based groups. A display is a get-together of modules gathered together and needed to fit a particular electrical burden. You've likely watched most bunches mounted on the rooftops of houses. These displays are planned to get a particular total of intensity through the range of a yr.

Efficiencies

Generally, solar modules convert around 10-15% of the essentialness that hits them into power. This deduces for every 100 units of imperativeness that truly accomplish the board, only 15 of them truly enter the home as power. This is the greatest field of research at present, as specialists see that gigantic degrees of progress in sun controlled capability will incite more affordable daylight based imperativeness.

Ac VS DC

The sheets produce facilitate stream (DC) control. Audit of a nursery hose that is essentially turned on produces water in a standard stream. Most home equipment and the electrical power structure are planned to take pivoting stream (AC) control. By and by accept that the water from leaving the nursery hose is being executed and on so quickly that it passes on a "beat". This is done in light of the way that AC control goes over long divisions altogether more successfully. This suggests, regardless, that the power leaving the sun put together group must be won with respect to AC if it

is going into your nuclear family. This is managed with an inverter, which experiences the DC power and makes AC control. The power is then arranged to profit your home, an electrical framework, or a breeze

2.21 Top Ten Solar Countries

We take in a pack about how Germany and Spain have extended sun arranged imperativeness fundamentally starting late with enduring government draws near. We in like manner take in a great deal about China's gigantic clean imperativeness push. Besides, paying little mind to burden persuading the US national government to do much for daylight based essentialness, we understand that the US is still incessantly pushing ahead on this improvement.

2.21.1 CHINA (130.4GW)

Believe it or not, China's normal record leaves a great deal to be required. This perception goes far to explain why its continuous undertakings haven't gotten much thought, despite the country detonating its daylight based point of confinement by 81 percent a year back. The state is wanting to get 20 percent of its ability using manageable methods by 2030 – an achievement made all the all the more invigorating given its old course record. By 2014 the country spoke to as much as 70 percent of the world's total presented daylight based warm limit – an example it is peachy to watch continued.

2.21.2 UNITED STATES (85.3GW)

The USA has the structure, capacity and natural conditions required for huge scale sun arranged rollout (not to raise the normally growing interest). Nevertheless, political assistance for limitless has been crude in actuality, and with Trump undermining to recover America from the Paris Agreement the future for sun controlled in America is far from without question. Regardless, the country's sun controlled prospects are far from uncovered. Different countries have characterize high supportable power source goals and sun arranged will build up an impressive promise to these. The manner in which things are, the US is home to a significant part of the world's greatest daylight based foundations, and moved private

2.21.3 JAPAN (63.3GW)

With since quite a while prior settled development and amassing portions, Japan was a trademark early adopter of sun situated age and continues progressing in the part, going for sun controlled to satisfy 10 percent of the country's imperativeness demand by 2050. Japan is praised for its Solar Ark building completed in 2002 which is one of the world's greatest solar structures and trains visitors about supportability. A Japanese association starting late made the world's best solar board.

2.21.4 India (57.4GW)

Inserting's into the sun situated diversion starting late as 2011, India is foreseen to make extraordinary strolls in progress by 2020, with the World Bank giving \$1 billion in advancing in this yr. in a manner of speaking. Furthermore, as shown by Power Web, its daylight-based impact has scarcely started, with the Modi government importance to pass on a presented point of confinement of 100GW by 2022. As a conveying state, daylight based in like manner accept an all-encompassing employment in warming and separating water in various Indian zones and epitomizes the likelihood to bounce age systems used by most

2.21.5 Germany (48.4GW)

Germany has hit the highlights starting late to make a bit of essential duties practical power source. It's the procedure demonstrates to ensure that, by 2050, the country gets something like 60 percent of its essentialness from supportable sources as an element of its push to cleave down carbon radiations. As Europe's driving country for limitless, Germany boasts just about 30 critical PV age plants, which each get at any rate 20MW yearly. Moreover, similar to the UK, the country is working up its own sun situated records this year

2.21.6 Italy (22.6GW)

Italy's quality in the rankings is atypical since it is a net essentialness dealer and requirements countless the advantages of its matches. In vindictiveness of this daylight based makes up around 10 percent of the country's imperativeness mix and is prepare to twofold in the next decade;

Eurostat has even exhibited that Italy could outperform its 2020 stamp. This method for influence age not simply addresses an open entryway for Italy to abuse a benefit it has in riches, yet near a chance to diminish dependence on remote age.

2.21.7 United Kingdom (14.2GW)

The United Kingdom outperformed France and Spain in 2015 to the extent presented limit. Close by genuine business solar foundations, dynamic governments have maintained exercises that enable daylight based block take among schools and property holders. Among April and September 2016, the UK's sun arranged loads up made more power than coal – on one particularly brilliant day daylight based property conveyed on various occasions more imperativeness than coal.

2.21.8 France (12.8GW)

With a hard economy and all around made essentialness fragment, it is little contemplate that sun arranged took off in France. In 2016, French President François Holland stayed with India's Narendra Modi to lay the setting up pit for the central office of the International Solar Alliance (ISA) in India. The foundation intends to make daylight based limits in countries between the Tropics of Cancer and Capricorn.

2.21.9 AUSTRALIA (12.2GW)

Since 2009, Australia's sun controlled proximity has snowballed, with its total PV point of confinement of two or three hundred megawatts creating to a strong 5.7GW in 2015. Until this point in time, the state has right around 20 daylight based endeavors (with a cutoff outperforming 1MW) at various elements of culmination. In any case, these promising results don't show the entire picture. Despite a lot of sunlight and fiscal improvement, many have destroyed the country's commonly low overall situating and are asking that the organization achieve more to help the productivity.

2.21.10 Pakistan (10GW)

While Pakistan simply transformed into a sun arranged country in 2012 when its first on-grid PV plant proceeded line, the Southern Asian country has high objectives. Key to its sun controlled system is the Quaid-e-Azam Solar Park, charged for realization this year, which, once totally operational, will have a 1GW utmost and will be the best of its sort in the world. Referable to the progressing decline in overall assessments, Pakistan is set to get control deals which could also drive down sun controlled imperativeness costs.

2.22 The Advantages and Disadvantages of Rooftop Solar Energy

Daylight based essentialness is gotten from the sun's radiation. The sunshine is a notable imperativeness source, and this essentialness source can be outfit by presenting sun controlled sheets. Did you see that the essentialness it brings home the bacon to the Earth for one hour could fit the planetary imperativeness prerequisites for one year? Regardless, we can harness simply 0.001 percent of that vitality. There is an inspiration driving why daylight based essentialness has transformed into an inclining subject when examining renewables. While it has been comprehensively denounced for being exorbitant or not certified profitable, daylight based essentialness has now attempted to be incredibly useful - for nature just as fiscally. To charge, due to the intrigue, the development has been improved stunningly, making into a through and through capable wellspring of clean imperativeness. If you are in the solar imperativeness, tendency and arranged to make your hypothesis, we are here to serve. We will supply you with up to four explanations free obviously and with no dedication, empowering you to consider different plans so you can choose the most sensible for you. Basically fill in the casing to request offers.

2.22.1 Advantages of Solar Energy

1. Renewable Energy Source:

Among all of the benefits of sun controlled sheets, the most important issue is that sun fueled essentialness is an extremely economical power source. It will in general be outfitted in every aspect of the globe and is usable reliably. We can't leave solar essentialness, rather than a part of interchange wellsprings of importance. Solar imperativeness will be accessible as long as we have

the sun; in this way sunshine will be useable to us for something like 5 billion years when according to scientists the sun is starting to go.

2. Reduces Electricity Bills:

Since you will play a part of your essentialness needs with the power your nearby planetary framework has delivered, your imperativeness bills will overlook. The sum you get a good deal on your nose will be liable to the range of the nearby planetary framework and your capacity or high temperature use. Likewise, not simply will you get a good deal on the power bill, just in case you produce more power than you use, the wealth will be exchanged back to the network and you will get additional portions for that aggregate (considering that your solar board structure is fixing to the cross section). Save assets can furthermore create if you move surplus power at high rates in the midst of the day and, buy control from the field in the midst of the eve when the rates are lower.

3. Low Maintenance Costs:

Daylight based imperativeness structures all around needn't mess with a great deal of thought. You basically need to go on them for the most part fresh, so immaculate them two or multiple times every year will do the endeavor. When in doubt, you can ceaselessly rely upon specific cleaning associations, which offer this organization from generally £25-£35. Most strong sun fueled board creator's offer 20-multiyear guarantee. Moreover, as there are no moving fragments, at that put is no mileage. The inverter is consistently the principle part that necessities to change following 5-10 years since it is interminably endeavoring to change over sun controlled imperativeness into power (solar PV) and high temperature (sun fueled warm). Next to the inverter, the connections in like manner expect backing to ensure your solar power system works at most prominent capability. By then, thus crossing the hidden cost of the close by planetary gathering, you can expect no expense on upkeep and reparation work.

2.22.2 Disadvantages of Solar Energy

1. Cost:

The basic expense of purchasing a close by planetary gathering is somewhat high. Despite the way that the UK government has drawn out a couple of designs for pushing the affirmation of feasible power sources, for example, the Feed-in Tariff, you even hold to deal with the candid costs. This fuses paying for daylight based sheets, inverter, batteries, wiring, and for the foundation. Regardless, sun controlled advances are consistently growing, thus it is ensured to acknowledge that costs will move dropping later on.

2. Solar Energy Storage Is Expensive:

Sun controlled imperativeness holds to be used quickly, or it might be taken care of in broad batteries. These batteries, used in off-the-structure universes, can be turned on in the midst of the day with the objective that the hugeness is used at night. This is a shielded objectives for utilizing sun fueled imperativeness for the duration of the day, anyway it is in like manner rather exorbitant. In numerous models, it is progressively splendid to just use sun controlled imperativeness in the midst of the light and take essentialness from the field in the midst of the dull (you can possibly answer this if your structure is associated up to the system). Luckily, your imperativeness solicitation is normally higher in the midst of the day and after that you can see a huge bit of it with daylight based essentialness.

3. Associated with Pollution:

Regardless of the way that defilement related to sun fueled imperativeness systems is far less diverged from various wellsprings of essentialness, daylight based imperativeness can be connected with spoiling. Transportation and foundation of wonderful bodies have been related with the arrival of ozone hurting substances. There are similarly basically unsafe materials and hazardous things used in the midst of the creation errand of sun situated photovoltaic, which can by suggestion incorporate the earth. Nevertheless, sun situated essentialness dirties far not actually other elective imperativeness sources.

2.22.3 Advantages and Disadvantages of Solar Off-Grid Systems

Advantages

1. Solar energy is a clean and renewable energy source
2. Lessens Electricity Bills.
3. Low Maintenance Costs.
4. Solar power is pollution free and causes no greenhouse gases to be produced after installation.

Disadvantage

1. Material and installation initial costs is high.
2. Uses a Lot of Space.
3. If there is no solar power at night then need for a large battery bank.
4. Electricity generation depends totally on a countries contact to sunlight this could be limited by a countries climate.
5. Devices that run on DC power straight are more expensive.
6. It do not produce much energy in cloudy days.
7. Lesser manufacture in the winter months.
8. The pollution related to solar energy systems is much less related to other sources of energy, solar energy can be connected to pollution.

2.23 Sarishabari Power Plant, Jamalpur

This is the principal ever solar power plant in Bangladesh situated at Shimla bazaar, Sarishabari of Jamalpur connecting eight sections of land of land. It remains in Sarishabari, Jamalpur, Bangladesh. Its primary goal to development the unwavering quality of power to the buyers and upgrade framework age limit and to improve lattice dependability. The Project Performing Agency by Bangladesh Power Development Board (BPDB). Its Type of Technology is Grid-Tied Solar photovoltaic power plant (PV Module: Poly Crystalline). The Sponsor name is Engreen Sarishabari Solar Plant Ltd. Its Project Location is Sarishabari 33\11KV BPDB Substation, Jamalpur, Bangladesh. Absolute Area of this plant is 8 (Eight) Acre. This power Plant complete limit is 3 MW. Its Tariff cost is 0.1897 US Cent/KWh, Equivalent 14.7491 BDT/kWh (Exchange rate: 1 USD = 82 taka). The contract was Signed in 18 February 2015. This plant Evacuating Voltage 33 KV [7] The edge of tendency is 38° in the winter and 7° in the summer.

2.24 Technaf's Hnila Solar Power Plant

The power plant in Technaf's Hnila has an ability to deliver 28 megawatts (MW) and will nourish 20MW to the nearby substation during daylight hours. The Bangladesh Power Development Board or BPDB had recently marked a 20-year bargain for 20MW of intensity with the plant's proprietor, Joules Power auxiliary Technaf Solartech Energy Ltd or TSEL, said TSEL in an announcement. The solar plant is the initial move towards the administration's objective of delivering 2,000MW of solar power by 2021. The plant discharges 20,000 less huge amounts of carbon dioxide every year than a comparative estimated diesel-run plant does. The project was co-financed by One Bank Ltd and Standard Chartered Bank [8].

2.25 Chandpur Solar Power Project

Bangladesh Economic Zone Authority (BEZA) has wanted to set up a solar power zone in Baher Char zone in Chandpur area with an objective of producing at any rate 1000 megawatts (MW) of power. "The specialist has begun the way toward procuring around 4000 sections of land of land in Baher Char to build up the solar zone, which will be the nation's greatest center point for solar power. Bangladesh Power Development Board (BPDB) and POWER CHINA have demonstrated enthusiasm for building up the solar zone trusting that the development of the solar zone will start

soon so it can begin producing power from one year from now. BPDB will get 1,000 acres land and the rest 3,000 acres for POWERCHINA for setting up the solar zone.[9]

2.26 Global Scenery of Solar Energy

Sun powered information on introduced limit (MW) and yearly yield (GWh) is sourced from the International Renewable Energy Agency. Worldwide introduced limit with respect to solar controlled power has seen an exponential development, stretching around 227 GWe toward the part of the arrangement. It created 1% of all power that is utilized all inclusive. The worldwide normal solar radiation, per m² and every year, can create a similar measure of vitality as a barrel of oil, 200 kg of coal, or 140 m³ of petroleum gas. Solar introduced limit by district Africa introduced limit 0.9%. The Middle East and North Africa have a limit of 0.6%. Latin America and the Caribbean have 0.9%. North America introduced limit is 13.2%. Europe 43.7%. South and Central Asia 2.5%. East Asia 32.2%. South East Asia and Pacific have a limit of 3.1%. The worldwide solar PV market is going to include more than 100 gigawatts of limit with regards to the first run through in 2018. Latin America will affix 5.6 gigawatts as well. The MENA region (The Middle East and Africa) will add 4.7 gigawatts in 2018.[10].

Chapter 3

METHODOLOGY

3.1 Introduction

This chapter eventually comprises the analysis methodology of the survey. NOCS Narayanganj. DPDC was infrequently visited for this survey. In additional details, during this section, the originator outlines the analysis strategy, the analysis methodology, the analysis approach, and the strategies of information assortment, the choice of the sample, the analysis method, the sort of information analysis, the moral issues and therefore the analysis limitations of the project. This audit was intended to research the socio-economic effects of the solar roof system and find the answers about what do the users think about its appropriateness. This study is applied to the business and industrial areas of Bangladesh. As the survey initially based on social analysis, some qualitative and quantitative methodological approaches are applied. Some of the houses were listed under DPDC and others were not. Necessary data from panel, battery was collected. User feedback was also collected from every possible individual consumer.

3.2 Steps of Working Procedure

Our work was about SRS under DPDC. From the start we make a few inquiries dependent on our markers. We chose a few zones, and they are S.M. Maleh Road, Khanpur, Fatullah, Chasara. At that point we visited their homes industry, emergency clinic and private house. We gather information from the shoppers and the meter and dissect the information. At that point we make the outcome.

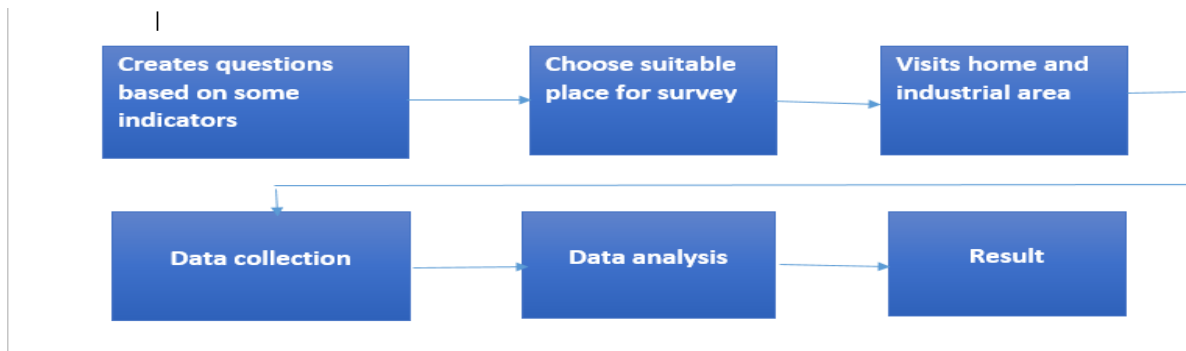


Figure 3.1: Flow chart of our working procedure

3.3 Survey Area

Our study subject is Solar Rooftop framework (SRS) under DPDC, Khānpur in Narayanganj District (Dhaka Division) it's situated in Bangladesh a little south-east of Dhaka, the nation's capital spot. Its land directions are 23° 37' 0" North, 90° 30' 0" East and its unique name (with diacritics) is Khānpur. See Khanpur photographs from satellite beneath, investigate the ethereal photos of Khanpur in Bangladesh.



Figure 3.2: DPDC area of Khānpur in Narayanganj

3.4 Survey Questions for SRS under DPDC

SL No	Indicator	Questions	Description
1	Consumer information	Owner Name Consumer NO Mobile number	In this question section we have just collect basic information of the consumers

		Name of NOCS Consumer Address	
2	Information of installation	i) Why do you install this SRS? ii) What kind of solar roof top system SRS are you using? iii) How many days ago you install this SRS? iv) Are you encouraged your solar power to the network?	We get some information about the establishment date, limit, establishment cost, introduce date, and so on. some consumer use on-framework close planetary system and some consumers utilize Off-network solar rooftop system.
3	Maintenance	i) Is your SRS in operation? ii) ii) Do you test it regular basis iii) iii) What is the main reason of system disorder? iv) iv) Do you want to repair it? v) v) Do you get any training for SRS operation? vi) vi) Do you clean your SRS?	In this question section we ask the consumers about their SRS maintenance, regular test, repair, training about solar panel etc. We take information of their total Solar Rooftop System.
4	Consumers	i) Do you think this SRS are useful?	In this segment we attempted to think about the customer's

	opinion	<ul style="list-style-type: none"> ii) Do you think it is a waste of money? iii) Do you face any kind of survey? iv) DO you want to increase capacity of your SRS? v) Do you satisfied to use SRS? 	assessment.
5	Cost Analysis	<ul style="list-style-type: none"> i) What is the total cost of your SRS? ii) Do you have record on solar electricity? iii) Is the meter reading of the solar electricity taken? iv) How much electricity do you get SRS? 	In this segment, the power age per unit and its expense are determined

Table 3.1 Survey Questions for SRS under DPDC

3.5 Summary

Most of the SRS were found on grid and in operation. Solar rooftop system is very important technology for our country. Narangonj is an industrial area and DPDC is the main power distribution company for NG. We worked under DPDC and it was survey in SRS holders

home/company. We visited there and collect some data which was given by DPDC. We try to aware them about their system and try to understand about the total benefits of the system.

Chapter 4

RESULT

4.1 Introduction

Conditions, feeling, arrangement and current circumstance of solar housetop framework for bringing financial advancement in BD have been talked about. It is reviewed from the past discourse that vitality assumes the principle job for advancement. Because of addition of fuel cost and expanding carbon emanation, there is a worldwide change towards sustainable power source like solar, wind and so forth. Being in torrid, Bangladesh is a solar vitality fruitful nation. Solar vitality can play an indispensable and secure vitality hotspot for reasonable improvement. The primary goal of this investigation is to survey the effects of solar vitality on financial advancement in Bangladesh. To confirm the goal experimentally, we went to NG to overview under DPDC. The study results are broke down as follows in the accompanying areas.

4.2 Consumers in Different Areas and SRS Capacity

In information investigation part we demonstrating the outcomes through the questionnaire portion part. In these part we attempted to demonstrate the consequences of the every thing of the questionnaire segmet. We additionally attempted to discover the arrangement from cry results.

Figure 4.1 shows that we utilized 5 overview tested information for making the outcomes. Between 5 overview data 15 information tests are arranged in East zone and 10 information tests are situated in west zone of DPDC under Narayanganj NOCS. There are 8 buyers house in Chasara zone and their SRS limit 40% , 7 buyers in Fatullah and their SRS limit is 31%, 6 shoppers in Khanpur and their SRS Capacity is 20%. 4 customers in S.M Maleh street and their SRS limit is 9%

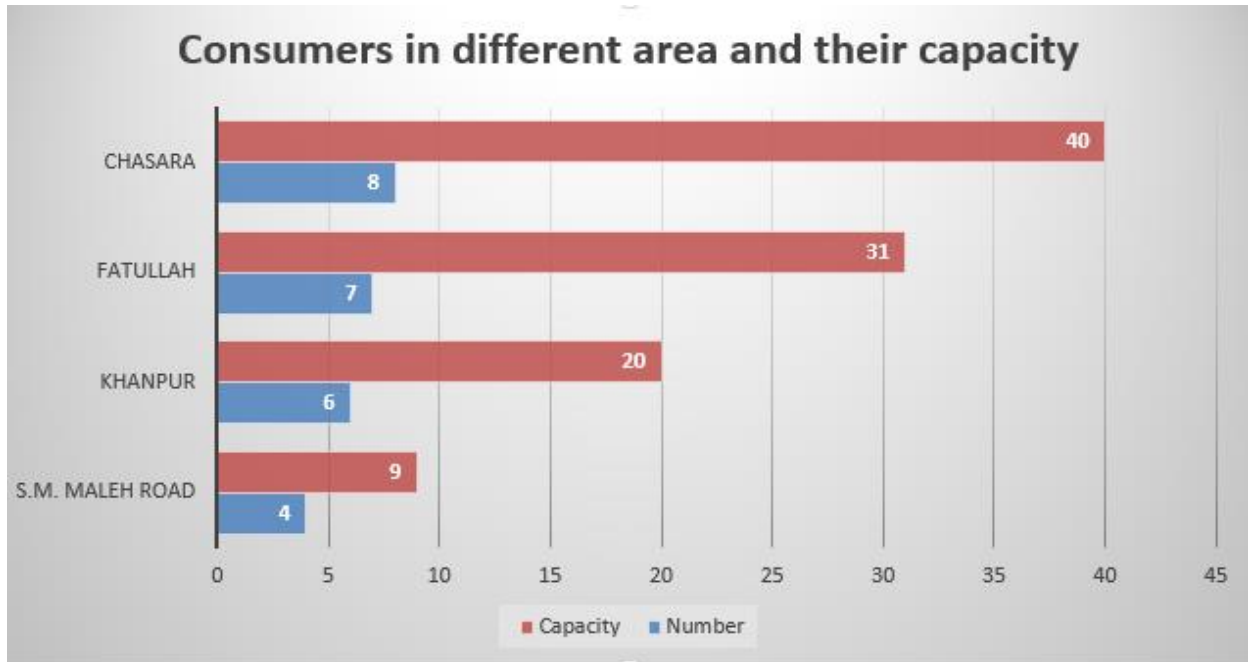


Figure 4.1: Total consumers

4.3 Data Analysis Basis on Number of Installation

In this part we needed to think about their establishment date. There were 25 absolute supporters in our gathering, among them 11 purchasers has introduced their SRS in 2018, 7 shoppers introduced their SRS in 2017, 4 customers introduced their SRS in 2016 and just 2 buyers introduced their SRS in 2015. So we can say number of portion are expanding step by step. Also, limit are expanding to a great extent.

NUMBER OF INSTALLTION IN DIFFERENT YEARS

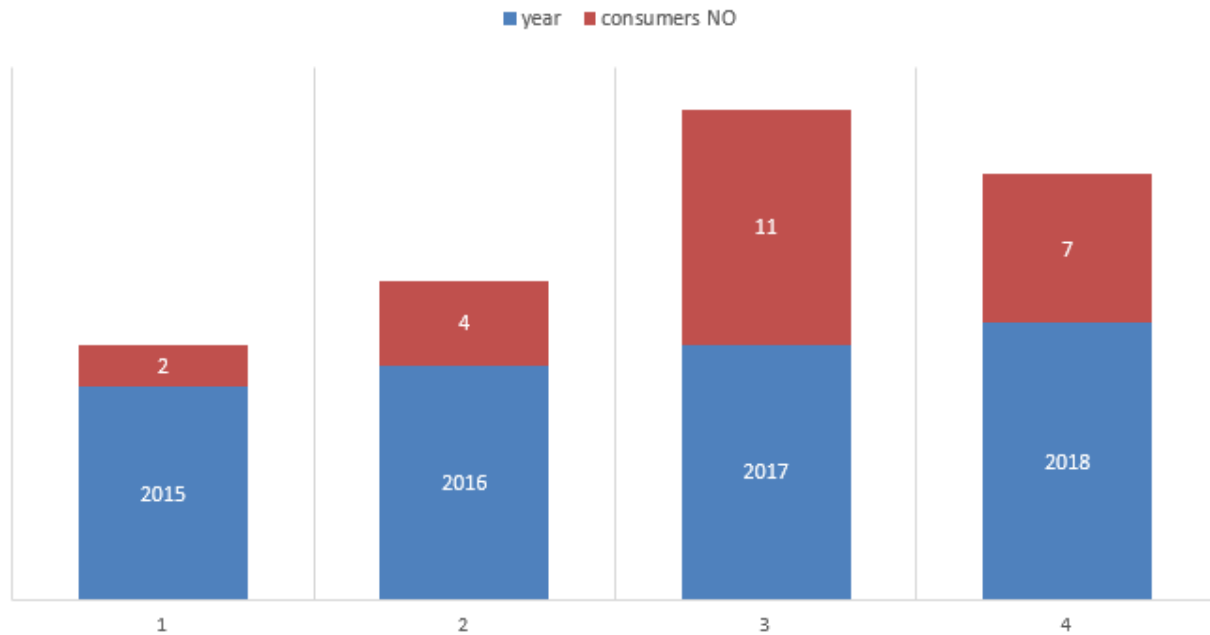


Figure 4.2: Chart of information of installation in different years

4.4 Brought the SRS

Figure 4.3 demonstrates that, in Narayanganj NOCS, between all purchasers information tests we chose 25 customer review information tests. In the middle of these, 18 customer are brought from market for introduce the close planetary system. What's more, 7 shoppers are brought office for introduce the close planetary system. For getting power association of high range building I mentatory to introduce the solar

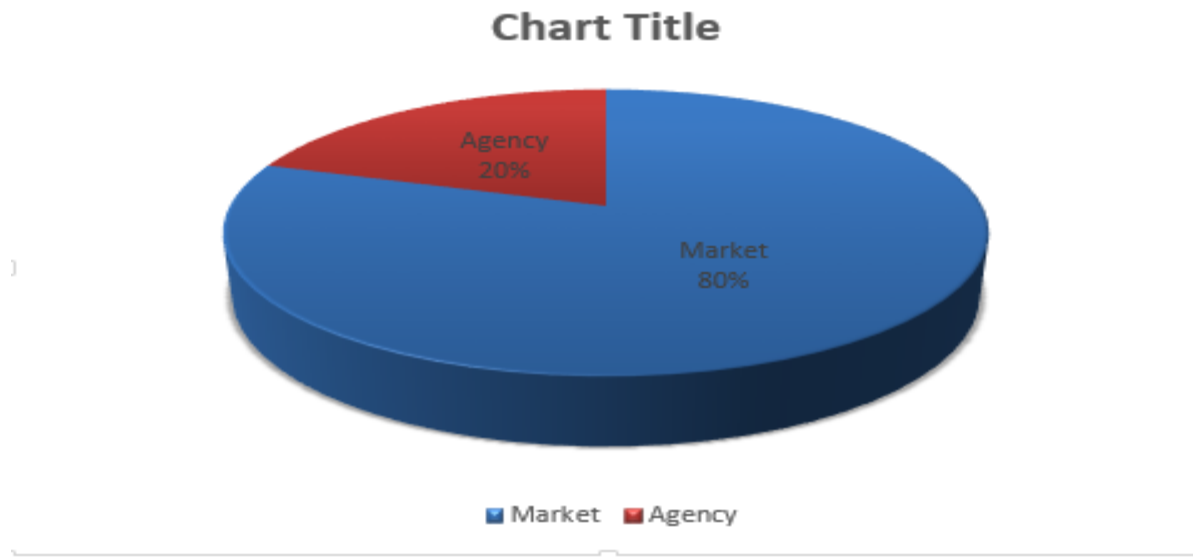


Figure 4.3: Brought the SRS

4.5 Installation Information

The greater part of the shopper educated that the SRS was really introduced by Policy commitment of Electricity association. Some shopper utilizes SRS for their own decision to get greater power for their employments. Then again, a dominant part of the individuals brought the SRS from the Market. They carried SRS to satisfy the necessity of their electrical association. Two diagrams are exhibited here where one of the outlines is about SRS introduced approach and another is about the Installation Year

4.6 Operating Condition

the majority of client are introduced the solar for getting the power association of buliding. These announcements demonstrate through the circle-type graph. In circle-type outline, the graph gives that 18 buyers are in now not-working condition. That implies they give the past proclamation. What's more, 7 buyers are in working mode. They feel that they getting a few advantages from solar.

4.7 Maintenance

4.7.1 Clean the solar panel

Figure 4.6 gives us data that in any event five of the shoppers of 9 families cleaned the close planetary system and the staying 4 customers didn't perfect the nearby planetary group. The table has the subsequent business. In the business area, a sum of 6 shoppers don't spotless the solar cell. Private House goes to the third in the table. Occupants can see the absolute purchaser 7. Three of them clean the solar cells and the staying four purchasers don't spotless the nearby planetary group. See table 4 at Hospital. The complete number of three shoppers in the Hospital. One of them cleaned the sun powered. The staying two don't perfect the solar.

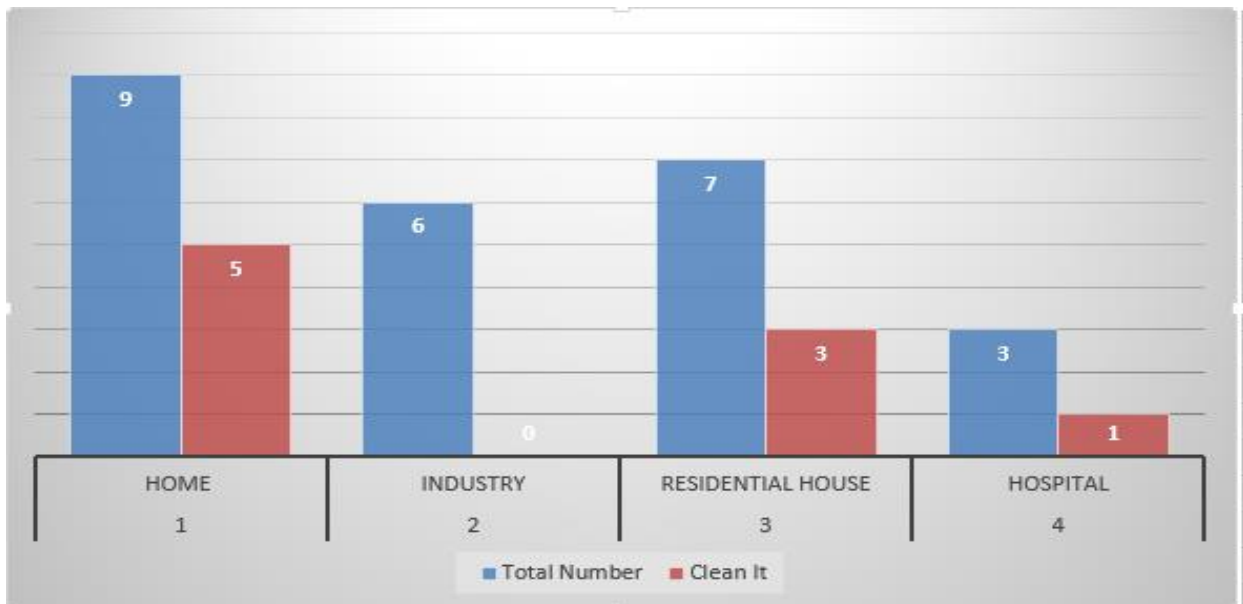


Figure 4.4: Cleaning the solar panel

4.7.2 Training and Facing any kinds of survey

we use vertically bar types diagram it percentage condition. From diagram, we can say that, between 100 present clients are not intrigued to taking any sorts of training for SRS working. They don't imagine that they are not considering solar employments. we can tell that 16 present clients are confronting any sorts of overview at least one time. What's more, 84% clients are not confronting any sorts of overview.

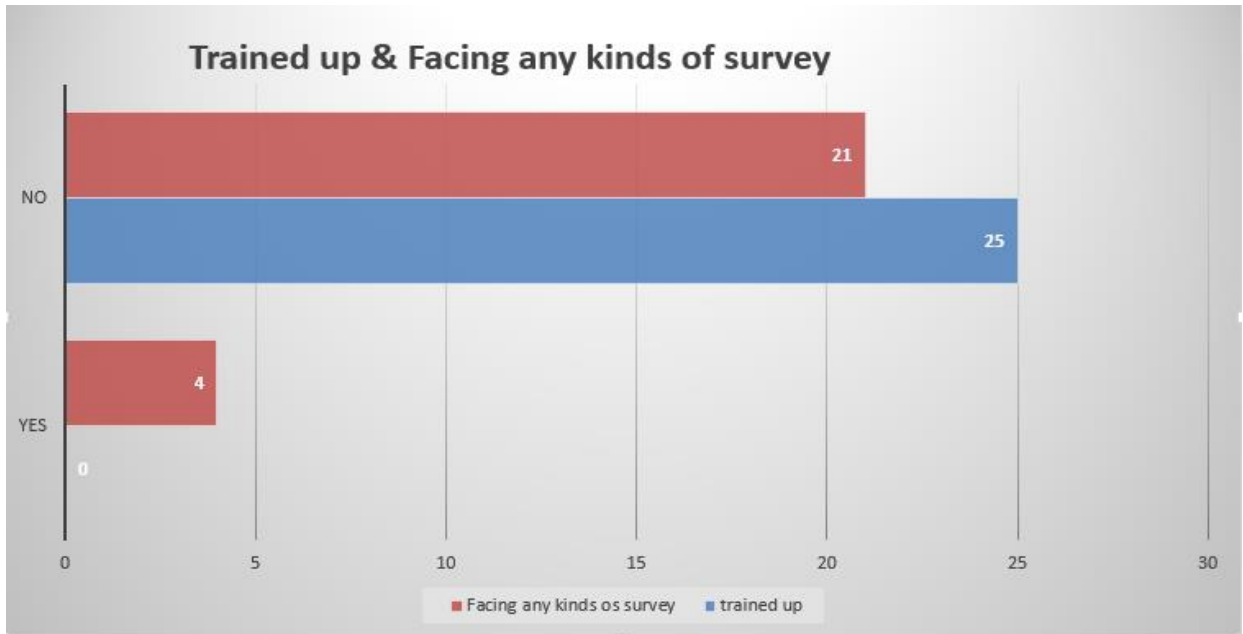


Figure 4.5: Training for SRS operation and facing any kinds of survey

4.7.3 Records of Solar Electricity

Figure 4.8 appearing with pie graph with number of the study. The diagram demonstrates that 3 clients are recorded the solar power. Furthermore, 22 clients are not recorded the solar electricity. These data demonstrates that they don't check the meter whether is worked or not worked

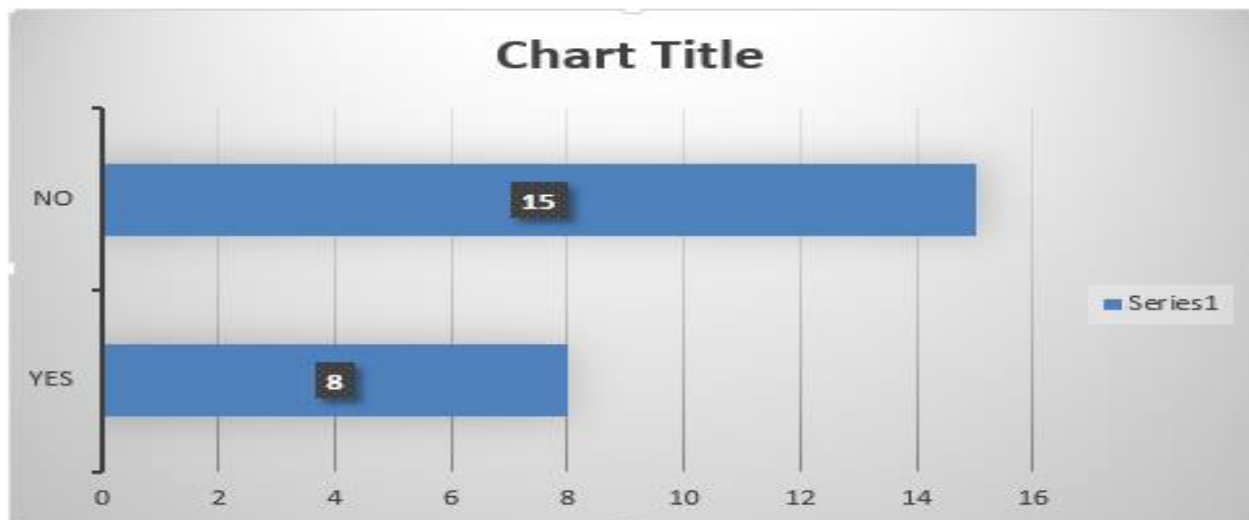


Figure 4.6 Records of solar electricity

4.8 Interested to Increase Capacity of the SRS

The graph type is Column type with x-hub and y-hub. It gives the data that 80% clients would not like to expanding the limit of the close planetary system and just 20% need to increment. They believes that the nearby planetary group isn't valuable.

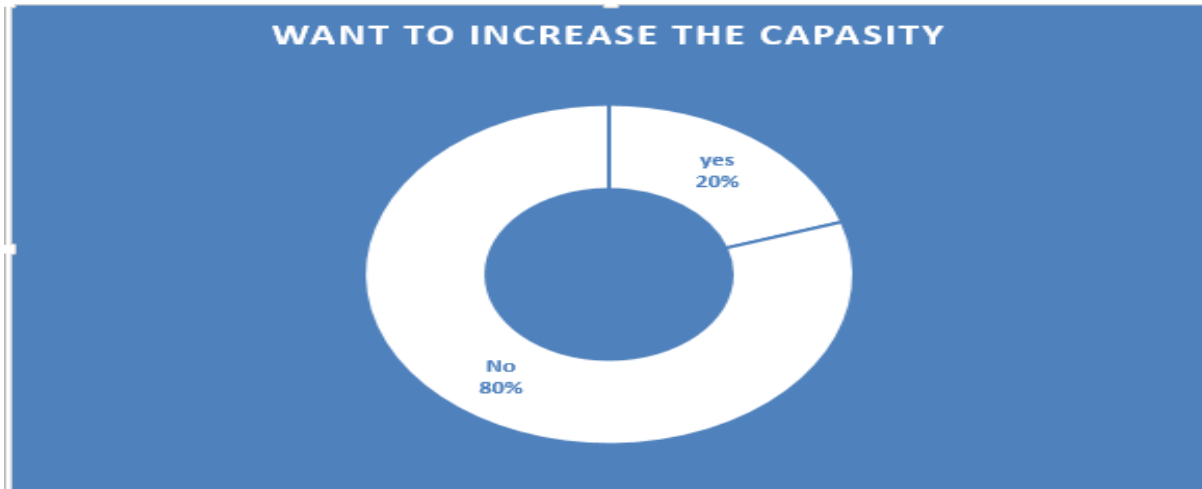


Figure 4.7: Interested to increase capacity of the SRS

4.9 Consumers Feedback

In the accompanying diagram, the examination of what number of buyers acknowledges the framework as a misuse of cash and what number of them think that its valuable is appeared. As per the examination, 20 shoppers are judged absolutely where the outcome demonstrates that 12 buyers believe that the introduced framework has quite recently been a misuse of their cash, 6 purchasers found the framework helpful, and rest of the buyers didn't either make any remarks on this inquiry.

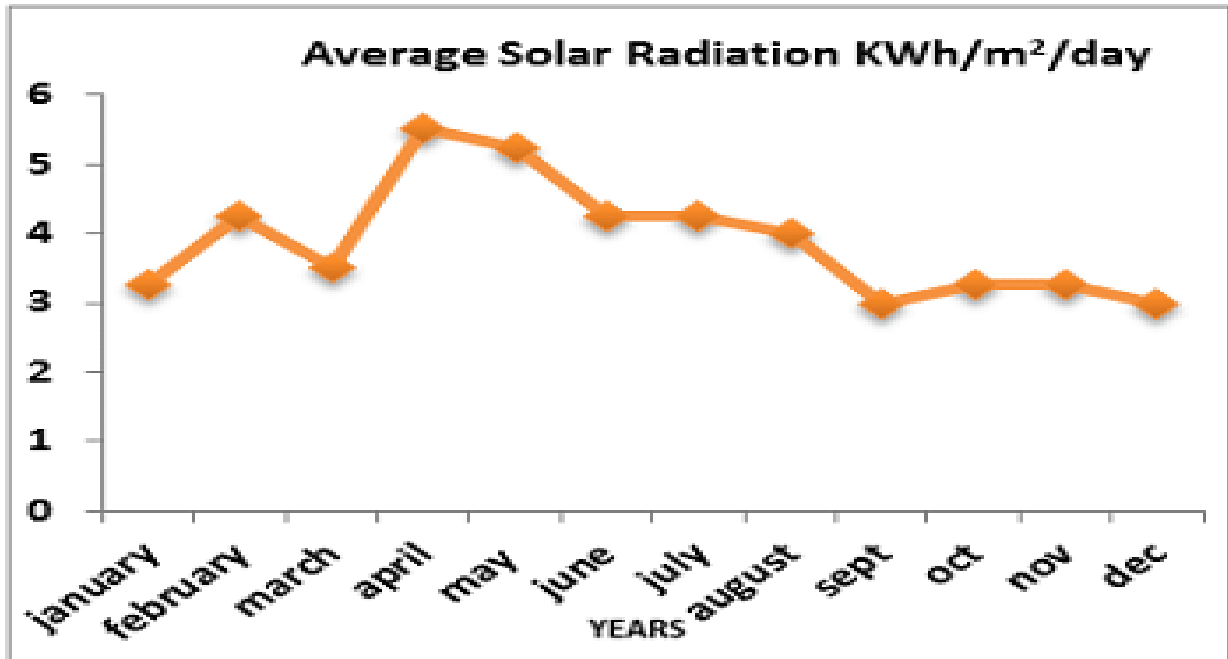


Figure 4.8: Monthly average solar radiation in Bangladesh

4.10 Buying System

This study report found that solitary 20% of the nearby planetary group is purchased from the market, 80% has been taken from the Solar System Agency since they don't know about the nearby planetary group.

4.11 Per unit Energy Cost

First Calculation:

We consider our proposed SRS system life time is 20 years. So, the cost per unit of energy by the SRS will be:-Meter reading = 7865.68 kWh.

Total cost of the system =350000 TK

Date of installment, 2016/02

Date of survey, 2018/11/20

Time duration= 2 years 5 months

$$= 2.75 \text{ years}$$

So, yearly generated = $(7865.68 \div 2.75)$ kWh/year

$$= 2860.247 \text{ kWh/year}$$

Total generation of energy will be after 20 years = 2860.247×20

$$= 57204.94 \text{ kWh}$$

Cost per unit of energy in taka = $(350000 \div 57204.94)$ Taka/ kWh

$$= 6.11 \text{ Taka/ kWh}$$

In below we added a table, which is indicating the previous two-cost calculation and more:

SL NO	Total Cost	Capacity(Kw)	Lifetime(year)	cost of per Kwh (Taka/Kwh)
1	120000	1	20	5.72
2	200000	1.92	20	5.1
3	90000	0.88	20	8.43
4	640000	10	20	4.65
5	150000	1.2	20	6.48
6	450000	5	20	4.97
7	100000	0.9	20	5.23
8	260000	2.3	20	6.5
9	570000	8	20	4.45
10	350000	6	20	5.28

Table 4.1 cost calculation

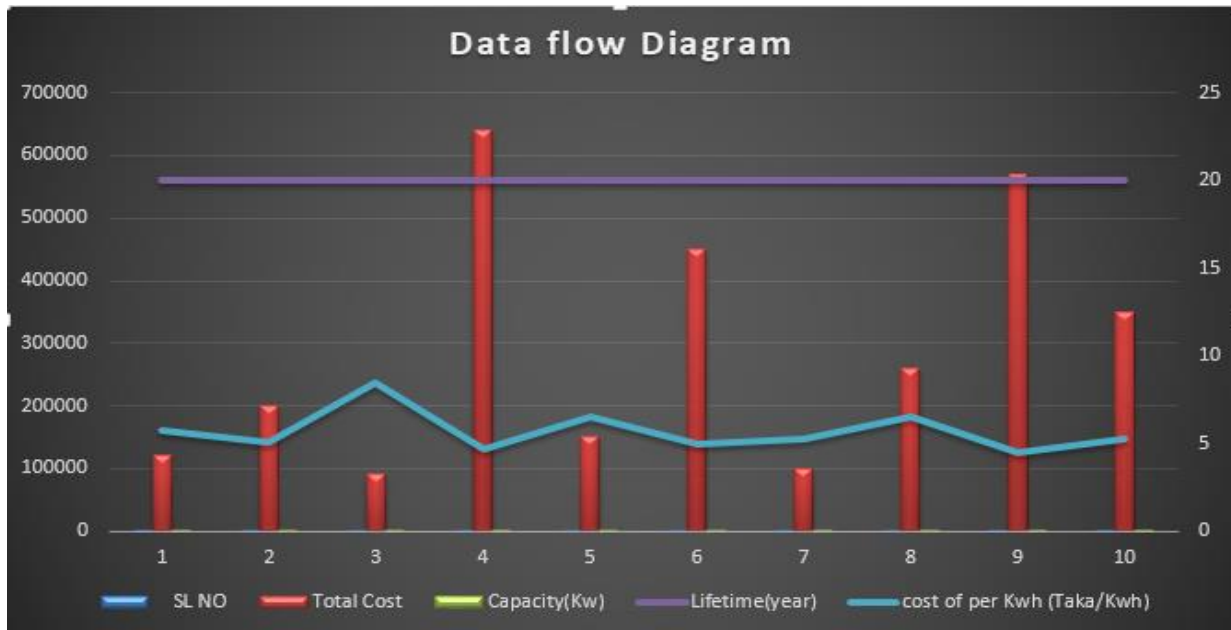


Figure 4.9 Data flow diagram

Average Cost per unit of energy is 5.6 Taka/ kWh

4.12 Result Analysis

This proposal reports that a great many people don't check whether the close planetary system works or not, at that point the nearby planetary group doesn't perfect it normally. Heavenly bodies are utilized to get the whole Building Solar System for Government Policy. The vast majority purchase the close planetary system and don't get it from the market and the office is at a more expensive rate. A great many people utilizing close planetary system don't keep meter readings in light of the utilization of power. Instructions to keep up a framework utilizing nearby planetary group and never utilize the nearby planetary group? Nearby planetary group clients, it is a decent close planetary system, yet no one needs to build the close planetary system in light of the fact that the essential expense is substantially more. The close planetary system is little and lattice joined to the vast majority of the projectile off networks. The administration has not helped the legislature to utilize the solar.

4.13 Summary

In the wake of finishing the study to the markers and investigating the outcome we discover a few issues. Shoppers need more learning about the SRS and they are not concern. Thus, here need to direct with them. Greatest purchasers never clean the board since they don't think about it. The authority should prepare them about SRS and advise about helpfulness. Dominant part of the shoppers don't think about net-metering framework. Along these lines, I figure association ought to illuminate them and educate the purchaser how they can utilize it appropriately. The fundamental issue is the expense of SRS is exceptionally high. In this way, Govt. ought to limit the expense.

Chapter 5

CONCLUSION

5.1 Overall Discussion

The target of this postulation is to examine the plausibility of solar housetop framework (SRS). Innovation was widely surveyed. This examination shows the noteworthy potential that exists for outfitting sun powered vitality and delivering power from the structure housetops. By executing this study under DPDC in the City of NG will set a guide to urban areas the nation over with regards to the natural and money related advantages of solar vitality and how to tap solar vitality using building housetops that are generally inactive. The underlying appraisals depended on a site survey and primer computations. A progressively itemized examination of the structures and electrical framework is required before establishment. The technique sketched out above can be applied to any huge scale housetop solar applications, for example, those claimed by urban areas or customers with countless structures. The utilization of solar board is expanding quickly everywhere throughout the world. Luckily, the area of Bangladesh is very reasonable for bridling solar vitality. The object of Thesis was to break down the plausibility of on network associated Rooftop framework in NG under (DPDC). Be that as it may, enormous zone is as yet revealed either by lattice power or by power produced from sustainable sources. In the on framework regions of Bangladesh, solar housetop framework (SRS) is getting well known step by step. Solar PV framework has risen as an option sustainable power source innovation everywhere throughout the world. It has various advantages in contrast with the customary power age frameworks, fundamentally contamination freeness and cost adequacy. In Bangladesh, where power age is a tremendous test, solar housetop framework can assume a significant job.

5.2 Future Scopes of the Work

Our atmosphere condition and topographical position are entirely ideal for solar housetop framework. We can't utilize it appropriately. Present time there is deficiency of power in Bangladesh. The present government has taken an appropriate activity that on the off chance that an individual needs to construct another structure, at that point he should utilize the solar housetop framework which ought to be on network. . DPDC needs to make the buyers mindful about this framework. Most extreme nearby planetary group is off framework yet government attempting to hand them over on network framework. In future by utilizing nearby planetary group age of power will increment and it will decrease ecological contamination. This audit is taken by methods for an interest in various territories of NG. The proposed exchange is in progress for another examination

under Dhaka City Corporation. Consequent to completing this examination both Dhaka and NG city we make a give a record of SRS system for DPDC which is help them with settling on decision about close by planetary gathering. Next, we have to make an investigation give a record of the whole country where SRS system are presented.

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