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Wiring System in Solar Plant

[1]Vijay Sonawane, [2]Nilesh Kapure, [3]Yogesh Gawai, [4]Paresh Bhole

[1,2,3,4]UG, Student, Department of Electrical Engineering, GF's GCOE, Jalgaon-425002, Maharashtra, India.

[1]*vijay.sonawane09@gmail.com*

Abstract- **Solar panels the vital element of this SBCS makes use of exhausted energy. Compared to all other energy solar energy is abundant and free that can be used to charge batteries used for any module or electrical kits which are obvious for daily usage. The Smart Charge Controller will be designed such, so that the solar battery does not get over charged thereby ensuring no reduction of durability of the battery. This kind of system requires sensors to sense whether the battery is fully charged or not. After fully charged, detection safety can be achieved by designing a logic system in the charger, which will automatically disconnect or cut power to the battery when it is fully charged. When the solar batteries come into account, they get charged in a very short time period considering of the sunlight hours per day. The variability and non dispatch ability of today's PV systems affect the stability of the utility grid and the economics of the PV and energy distribution systems. Integration issues need to be addressed from the distributed PV system side and from the utility side.**

Keywords- Grid connection, Equipments, Special consideration, Safety.

I. INTRODUCTION

This report is based on the wiring connection of PV Solar system in commercial buildings and residents. We will help to selecting considerations and planning to decide and design the solar plant fir subcontractor. It will help designer to take some strict decision while design of Solar plant. The solar plant design presented to reviewing the various types of electrical installations methods, including types of PV models, inverters, charge controllers, lightning protection, Grounding, power storage, battery sizing, backup system, safety while installation and cable selection for wiring system.

The project is installed in our institute i.e. 5 KVA and the topics are distributed in all groups with particular topic. The wiring system in solar power systems is our topic for project study process. We will discuss this topic in detail.

II. LITERATURE SURVEY

Day by day rising energy production cost and environmental aspects recall the solar system to use in now a day. A solar power system provides energy free of cost and reliable source of supply system in a year. The advantages to the consumers using solar system:

- Saving an electrical bill.
- Providing boosting energy to grid system due to which no of unit minimize in using electrical energy from any state electrical board.
- Using a clean, reliable, priceless power 20-25 year.
- Helping to creating a jobs and business in solar system.

Most solar systems will be provided by Indian government with concession, tax free, credits which give better choice to selecting solar system to the consumer. That means consumer can enjoy free electrical system for 20-25 years. If consumer installs batteries to back up solar system, then this system provide emergency supply system. The Appraisal Journal says, a solar system increases your home's value by reducing all over cost of energy uses and installation of solar system to the homes. Solar power reduces foreign countries dependence on foreign oil and fossil fuels for production of electrical energy. It helps to reduce air pollution and production of greenhouse gases. It makes the nations more secure and helps to increase the country currency value solar power system is setup such that they produced high amount of power in any whether condition. You can conclude no of panels required for production of electricity. To obtain maximum power generation from the system some considerations are

required i.e. angle of PV module, shades, dust, panel conversion, losses in cable. In sunny climates an average 1-kilowatt system with optimal orientation and tilt will produce between 1,400 and 1,700 kilowatt hours per year. Many consumers who install solar electric systems in their housing developments estimate that a 2.4-kilowatt system will offset 40% to 50% of the electricity needs of an energy-efficient home. That number may be depending on the amount of sunlight your home receives each year and the energy efficiency of your home.

III. Overview Of Wiring System Of Solar System

First of all by analysing the side where solar plant has to be installed the requirement of various components with ratings and types. Solar system is installed by engineers and experts by using their experience and studies.

Some important components of grid connected solar systems with and without battery backup are:

1. Solar PV module Array
2. Charge controller
3. Batteries
4. Inverter
5. Disconnects
6. Surge protection
7. Kilowatt hour energy meters

The simple wiring connections are shown in below fig.

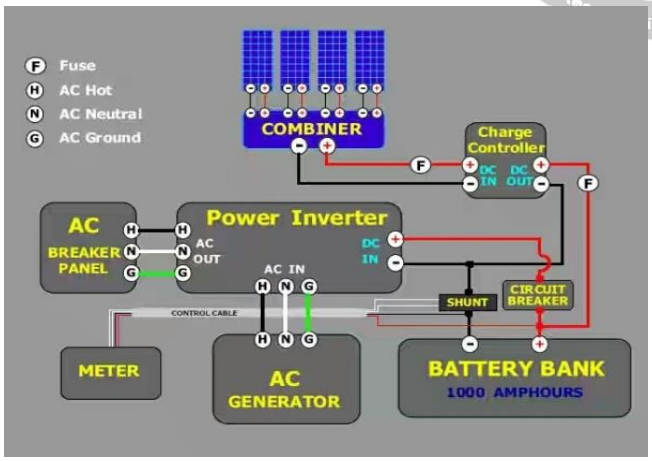

Fig.1 Normal Solar system Wiring Connection

IV. Wiring design in solar plant

Essentially solar power installations include a hybrid of technologies consisting of basic ac and dc electric power and electronics a mix of technologies, each requiring specific technical expertise. Systems engineering of a solar power system requires an intimate knowledge of all hardware and equipment performance and application requirements. In general, major system components such as inverters, batteries, and emergency power generators, which are available from a wide number of manufacturers, each have a unique performance specification specially designed for specific applications. The location of a project, installation space considerations, environmental settings, choice of specific solar power module and application requirements, and numerous other parameters usually dictate specific system design criteria that eventually form the basis for the system design and material and equipment selection. Issues specific to solar power relate to the fact that all installations are of the outdoor type, and as a result all system components, including the PV panel, support structures, wiring, raceways, junction boxes, collector boxes, and inverters must be selected and designed to withstand harsh atmospheric conditions and must operate under extreme temperatures, humidity, and wind turbulence and gust conditions. Specifically, the electrical wiring must withstand, in addition to the preceding environmental adversities, degradation under constant exposure to ultraviolet radiation and heat. Factors to be taken into consideration when designing solar power wiring include the PV module's short-circuit current (Isc) value, which represents the maximum module output when output leads are shorted. The short-circuit current is significantly higher than the normal or nominal operating current. Because of the reflection of solar rays from snow, a nearby body of water or sandy terrain can produce unpredicted currents much in excess of the specified nominal or Isc current.

All feeder cables rated for a specific temperature should be derated by 80 percent or the capacity multiplied by 1.25. Cable ratings for 60, 75, and 90°C are listed in NEC. For derating purposes it is recommended that cables rated for 75°C capacity should use 90°C column values. Various device terminals such as terminal block over current devices must also have the same insulation rating as the cables. In other words, if the device is in a location that is exposed to a higher temperature than the rating of the feeder cable, the cable must be further derated to match the

terminal connection device. The following example is used to illustrate these design parameter considerations. As mentioned earlier, all PV array frames, collector panels, disconnect switches, inverters, and metallic enclosures should be connected together and grounded at a single service grounding point. To obtain the lossless power from the system cable size and cable types are considered.

V. Special Consideration in Wiring System

While wiring installation of solar PV systems, there are at least two consideration that an electrical contractor or electrician may not have previous experience with. First, the system from the array side of the inverter must be designed for DC power generation, which needs wire sizes larger than for AC power at the same ratings. Second, array wiring must be in proper sized and selected to withstand particular temperatures. The current-carrying capacity of a wire must be adjusted to consideration for temperature conditions that present in solar systems. Worksheets on wiring sizing are included in the solar system installation: Design and Installation Manual (Solar Energy International 2007).

VI. Safety during the Installation

Solar systems require that engineers and electricians work on the roof. It's the builder's responsibility to provide the safe practices during the installation. Improper safety equipment can result in fines to the builder while installation of solar plant. A main problem is occurring in solar systems is that solar modules generate DC electricity when exposed to sunlight. As well, solar systems may be of multiple electrical modules, the utility grid and batteries. Manufacturers of modules and other electrical components will provide safety precautions by manual of safety precaution carefully followed. While installing the modules on the roof, at least one safety eye must be installed. Work should be done under some experts and experienced person to supervising the installation of solar plant.

Power arrays, when exposed to the sun, can produce several hundred volts of dc power. Any contact with an exposed or uninsulated component of the PV array can produce serious burns and fatal electric shock. The electrical wiring design and installation methodology are subject to rigorous guidelines. Some important safety precautions to be necessary as follow:

- ✓ Do not attempt to service any portion of the PV system unless you understand the electrical operation and are fully qualified to do so.
- ✓ Use modules for their intended purpose only. Follow all the module manufacturer's instructions. Do not disassemble modules installed by the manufacturer.
- ✓ Do not open the diode housing and junction box placed on any factory-wired modules on back side.
- ✓ Do not use modules in systems that can exceed 600 V open circuit.
- ✓ Do not connect or disconnect a module unless the array string is opening circuited. All the modules in the series string are covered with non transparent material.
- ✓ Do not install in stormy and rainy season.
- ✓ Take care from falling any object on solar module.
- ✓ Do not stand or step on modules.
- ✓ Do not work on PV modules when they are wet. Keep in mind that wet modules when cracked or broken can expose maintenance personnel to very high voltages.
- ✓ Do not attempt to remove snow or ice from modules.
- ✓ Do not direct artificially concentrated sunlight on modules.
- ✓ Do not wear jewellery when working on modules.
- ✓ Avoid working alone while performing field inspection or repair.
- ✓ Wear suitable eye protection glasses and rubber gloves while working on panel.
- ✓ Do not touch terminals contacts (conducting parts) while modules are exposed to light without wearing electrically insulated rubber gloves.
- ✓ Keep the fire extinguisher always ready, a first-aid box while performing work on a solar plant.
- ✓ Do not install modules where flammable gases or vapours are present.

VII. Experimental Result

The solar plant is installed reliably by including the analysis, experiments and safety. The output from the plant is having very less amount of power consumption, good power transfer ability, metering system, monitoring system with Wi-Fi and various protection systems. So the plant is

able to produce low lossless power, efficient and the long life chances. The wiring system provided for plant is such that very less amount of voltage drop is present.

VIII. CONCLUSION

The emergent need for electricity has led to a countrywide propagation of solar energy based electricity generation systems that integrate battery storage through the use of Solar Home Systems (SHSs) and a large portion of the country's population is dependent on a strenuous means of livelihood that is rickshaw (tricycle) pulling. To tackle the problem, implementation of Solar Battery Charging Station (SBCS) has emerged to the rural Bangladesh as well as in urban areas to change the scenario. Thereby, software implementation of SBCS is vitally important to monitor the system and keep the batteries safe. While maintaining the batteries of the SBCS manually, there might occurs mistakes and batteries can get overcharged. But doing it using software is not only safe but also time and cost effective. Thereby our motto is to make the cost-effective software for monitoring the station from remote region even-though. With the completion of our GUI we will be able to screen multiple batteries concurrently under the same monitor and will allow for the real time visualization of all types of readings, such as the voltage and percentage charge of each battery. PV has a powerful attraction because it produces electric energy from a free inexhaustible source, the sun, using no moving parts, consuming no fossil fuels, and creating no pollution or green house gases during the power generation. So, it is our wish to make the P-V system more efficient so that it can help for betterment of life.

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