Installation of Solar Panel System

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Abstract – Our aim is to install a solar panel on girl's hostel renewable energy resources may be used directly, or used to create other more convenient forms of energy. The potential of renewable energy sources is enormous as they can in principle meet many times the world's energy demand. A transition to renewables-based energy systems is looking increasingly likely as their costs decline while the price of oil and gas continue to fluctuate. In the past 30 years solar and wind power systems have experienced rapid sales growth, declining capital costs and costs of electricity generated, and have continued to improve their performance characteristics. In fact, fossil fuel and renewable energy prices, and social and environmental costs are heading in opposite directions and the economic and policy mechanisms needed to support the widespread dissemination and sustainable markets for renewable energy systems are rapidly evolving. It is becoming clear that future growth in the energy sector will be primarily in the new regime of renewable energy, and to some extent natural gas-based systems, not in conventional oil and coal sources.

Index Terms – Solar photovoltaic, Solar Module, Panel, Power system, solar active heating systems, heat pumps, solar architecture.

1. INTRODUCTION

Today, the world's energy supply is largely based on fossil fuels and nuclear power. These sources of energy will not last forever and have proven to be contributors to our environmental problems. In less than three centuries since the industrial revolution, mankind has already burned roughly half of the fossil fuels that accumulated under the earth's surface over hundreds of millions of years. Nuclear power is also based on a limited resource (uranium) and the use of nuclear power creates such incalculable risks that nuclear power plants cannot be insured. After 50 years of intensive research, no single safe long-term disposal site for radioactive waste has been found. Although some of the fossil energy resources might last a little longer than predicted, especially if additional reserves are discovered, the main problem of 'scarcity' will remain, and this represents the greatest challenge to humanity.

Renewable energy offers our planet a chance to reduce carbon emissions, clean the air, and put our civilization on a more sustainable footing. Renewable sources of energy are an essential part of an overall strategy of sustainable development. They help reduce dependence of energy imports, thereby ensuring a sustainable supply and climate protection.

Fig.1: Solar Panel Installed on Hostels Roof

Simply stated, batteries are used to power remote load needs with solar energy used to keep the batteries charged. However, the application of remote solar power systems presents a complex and varying set of challenges. Solar modules, power controller modules, and batteries are the three

primary components of the Solar Power System. Various combinations of the three allow the customer to choose a system that most matches site conditions such as load level requirements and availability of daily sunlight. With the deep cycle battery(s), recharged by solar modules, providing load power for customers' remote equipment, the power controller module optimizes control of battery recharging while protecting components during the extremes of solar energy availability as well as protecting the battery from damage due to overcharging.

2. RELATED WORK

2.1 Required Tools

The following tools will be needed to assemble the Solar Power System:

- Screw driver
- Socket and wrench set
- Small Hammer
- Pliers
- Voltage meter
- Compass

A. Before You Begin

The system must be installed as described in this manual to ensure reliable operation of the systems. Confirm system load is consistent with design specifications and your established Ahrs/day load will not exceed the battery capacity in the targeted days of autonomy required.

B. Identifying a Site

Careful selection of the exact location for placement of the system is crucial to continuous and reliable system operation. Exposure to shadowing from cut hillsides, trees, utility poles or any other objects during sunlight hours will reduce power capacity and should be avoided.

C. To Select a Site

Shading critically affects a photovoltaic array's performance. Even a small amount of shade on a PV module can reduce the module's performance significantly. It is essential to have a clear understanding of the sun's path across the horizon from the east to the west. Unfortunately it is not possible or practical to monitor the sun exposure at a site through long-term observation.

Solar contractor installation professionals have developed tools to provide quick insight to the solar window at a specific location. In principle these tools evaluate a site by creating a Sun Chart. If a site is partially shaded, the sun chart will determine the amount of available sunlight.

D. Determining the Solar Module Tilt Angle

The sun's height above the horizon is called altitude, which is measured in degrees above the horizon. When the sun appears to be just rising or just setting, its altitude is 0 degrees. When the sun is true south in the sky at 0 degrees azimuth, it will be at its highest altitude for that day. This time is called solar noon. A location's latitude determines how high the sun appears above the horizon at solar noon throughout the year. As a result of the earth's orbit around the sun with a tilted axis, the sun is at different altitudes above the horizon at solar noon throughout the year.

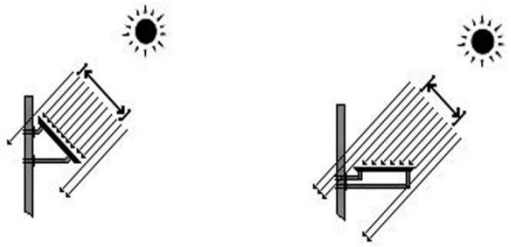

Fig.2: Angle of Incidence on a Solar Module

Seasonal changes of the sun's altitude must be considered to optimize a system's performance. When the array is installed, it should be tilted at an angle that yields the highest value of insolation during the worst case month in the year. This ensures that the system is designed to meet the load demand and keep the battery fully charged in the worst month for the average year. The following general guidelines outline a rule of thumb tilt angle of a solar module for different seasonal loads.

3. PORPOSED MODELLING

This Figure 3 illustrates a complete solar power system installation. The solar array is a group of solar modules that converts solar energy to electric power to keep the battery(s) charged. Depending on load needs, single or multiple solar modules create a solar array. The solar array supplies current through a solar controller to a bank of batteries to keep the batteries charged. Since the solar array is sized to power 100% of the load throughout the year, the solar modules are sized to match worst expected weather conditions (least amount of available sunlight) and mounted to maximize year round exposure. The solar controller monitors battery terminal voltage and passes the current through from the solar modules to the battery bank to maintain charge on the batteries. As the battery voltage rises to 14.0 VDC, the controller limits the amount of current provided to the battery to prevent overcharging. As the terminal voltage drops, the controller will pass more current to the battery to maintain the terminal voltage. Since these systems are at sites with all weather conditions, the controller will also adjust this voltage for temperature compensation. In situations where the battery

voltage level could fall below 11.5VDC, such as continuous days of cloudy weather, the controller is designed to disconnect the load. When the battery charges to a voltage of 12.6VDC, the controller will reconnect the batteries to the load. This feature prevents discharging the battery to a level that could damage and shorten battery life.

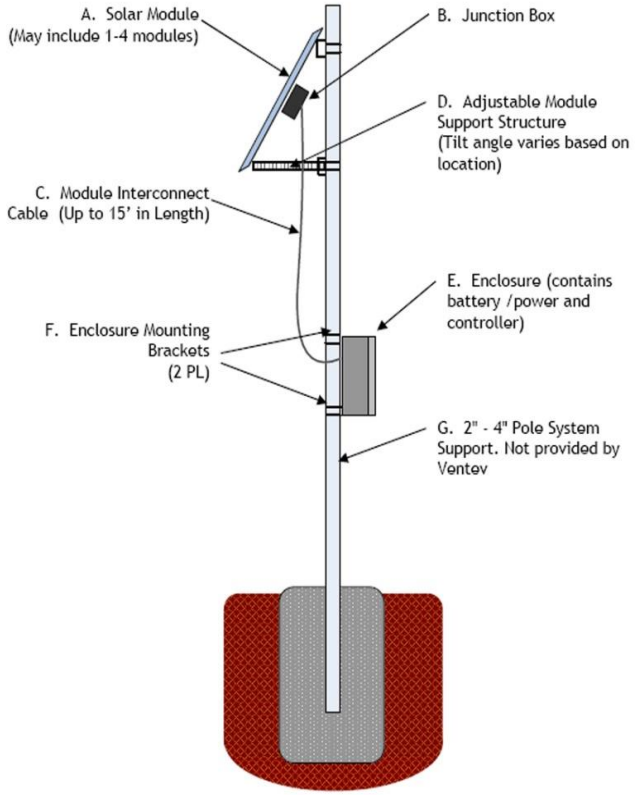

Fig.3: Solar System Architecture

The solar system is delivered to the customer site with each of the following major components.

A. Solar Module

Solar modules provide the energy source to keep battery(s) charged. The number of modules needed depends on site specifics, such as geographic location in the country, site specific needs such as load demand, and available/access to the sun. Figure 4 is a photograph of a typical solar module.

Solar electric modules convert the sun's energy into direct current (DC) electricity. The systems contain a matrix of high performance monocrystalline or multicrystalline modules. The Solar modules are securely attached to the pole with adjustable fasteners to enable tilt alignment to match the latitude at which the module is installed and horizontal adjustment for maximum tracking of the sun.

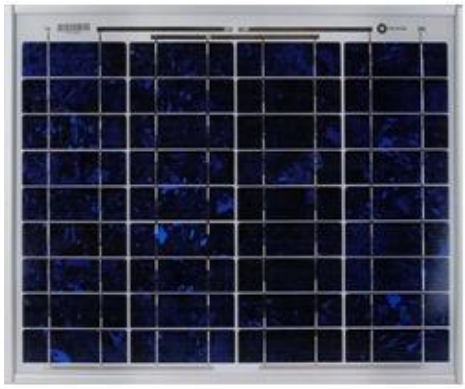

Fig.4: 12 Volt, 20 Watt Solar Module (BP Solar SX 3201)

B. Junction Box

The junction box provides a junction to connect the module(s) to the solar controller through a fused circuit inside the enclosure. Multiple solar modules can be connected together, either in series or parallel depending on voltage requirements, and via a single multi-conductor cable connected to the solar controller.

C. Module Interconnect

The module Interconnect is a multi-conductor cable sized sufficiently to carry the current to the solar controller from the solar modules. The cable comes preconfigured with connectors, etc.

D. Adjustable Module Support Structure

The configuration shown in Figure 3 is a single solar module configuration. Support structures come in varying sizes and configurations to accommodate the types, number and size of solar modules and pole sizes on which they will be mounted. Therefore, the customer is required to provide the pole size consistent with the solar system size (which determines the pole size needed.)

E. Enclosure

The enclosure houses the battery, solar controller, wiring, termination blocks and fusing for the system. Figure 5 shows a typical enclosure in the configured system housing two batteries, wiring, and the solar controller.

The enclosures arrive on site pre-wired per the purchaser's needs, including the solar controller, terminal blocks, and fuses mounted on DIN rails. The enclosure is typically sized to accommodate batteries which are staged in the bottom of the enclosure. Smaller system enclosures are of polycarbonate composition, and the remaining powder coated aluminium sized to accommodate the batteries required.

Fig.5: Typical Enclosure with Solar Module

4. RESULTS AND DISCUSSIONS

4.1 Assembling and Mounting the Solar Module Support Structure

The load capacity, equipment size and geographic location of the Solar Power System purchased determines the number of solar modules needed. Also, mounting configurations are driven by the pole size and number of solar modules needed. The following figures show various pole mounting configurations for the solar modules and how the module interconnect conduit assembly is installed in a 2-solar module mount assembly.

Fig.6: Pole Mounted Module

Figure 6 shows how the interconnect conduit assembly is installed on a two module assembly.

Fig.7: Dual Arm Single Module Mount.

Fig.8: Two Module Mount with Module Interconnect Conduit

5. CONCLUSION

We have presented a detailed description of installation of solar panel system on girl's hostel. We hope you like our system area residents who are taking advantage of a local renewable resource to generate their own clean, green power. Solar panel system is a publicly owned utility dedicated to exceeding our expectations in producing and delivering low cost, reliable power in an environmentally responsible and safe way. We are committed to delivering the best customer service experience of any utility in the nation.

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