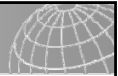


Introduction to Solar Power Supply System

July 19,2011
ECO, Addis Ababa



Outline

- Objective of the training
- Refresher about energy sources
- Relation between Sun and Solar electricity
- Important issues about solar
- Basic components of the PV system
- Basic functions of the system components
- Utilization and maintenance of PV system



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Introduction

Objective of the EUT

- To Introduce solar energy and its use
- To capacitate the end-user to manage and protect the installed system at the HC
- To increase confidence of the end-user about the solar system
- To enable the HC community in handling the installed system (which is installed in collaboration with MoH and ECO)



Participants of this training will:

- Learn basics of solar PV light and power supply system and its main components
- Learn about the advantages and limitations of solar PV power supply System
- Learn about the system installed at the HC in collaboration with FMoH and GIZ-ECO
- Learn the care and maintain the installed system require
- **Methodology:**
 - **Input presentation** (basics about solar system, introduction about the installed system)
 - **Hands on exercise** (Maintenance and controlling of the installed system)



Who give us energy?

- Water
- Wind
- Sun (solar)
- Geothermal
- Biogas
- Coal
- Bio-mass
- ...
- How many of these exists in Ethiopia?



Some facts about our Sun (solar)

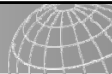
- Sun Is one and the most important star around the earth
- Sun is the source of energy for our earth
- Sun has provided heat when human being felt cold and when he needs to dry his clothe
- Green plants give us energy when we eat them and when we use them for cooking our food
- But, now through utilization of different technologies man kind is using sun in different forms



Sun gives its energy in the form of ray and heat

The energy collected as a ray or heat is converted in to three forms

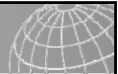
- 1. Chemical Energy :-** through the process of photosynthesis plants convert solar energy to chemical energy and use the energy for themselves.
- 2. Heat Energy :-** through utilization of different technologies solar energy is utilized to heat water, warm our rooms and production of steam
- 3. Electric Energy :-** through utilization of solar Module the solar energy is utilized to light and power our life (light, information and pumping of water...)



Our concern in this presentation is Solar electricity (Solar PV system)

Basic fact:

- Solar electricity is an energy converted directly from the sun with the help a Module
- This solar electricity could be used for different purposes like
 - light (through lamps),
 - Information (radio, TV)
 - Health (laboratory equipments, ...)
 - Water (pump)
 - Transport (car, train)



Solar electricity could be used for different purposes

- For house hold use: eg.
- For Small businesses and institutions: eg.
- For Health post/ centers : eg.
- For communication: eg.
- For community services: eg.



Important issues related to solar electricity

1. Solar energy arrives on the surface of the earth in a wide area , hence collecting and converting it requires knowhow and resource.
 2. Sun is not available in the night and cloudy seasons and locations, so storing the energy require knowhow and resource
1. Natural resource degradation from one side and the expensiveness of the fuel on the other hand.
 2. The advancement of technology in producing solar system components like modules, regulator , and batteries creates opportunity

Due to the above reasons solar technology is not developed as it should

Due to the above reasons creates an opportunity for solar system utilization

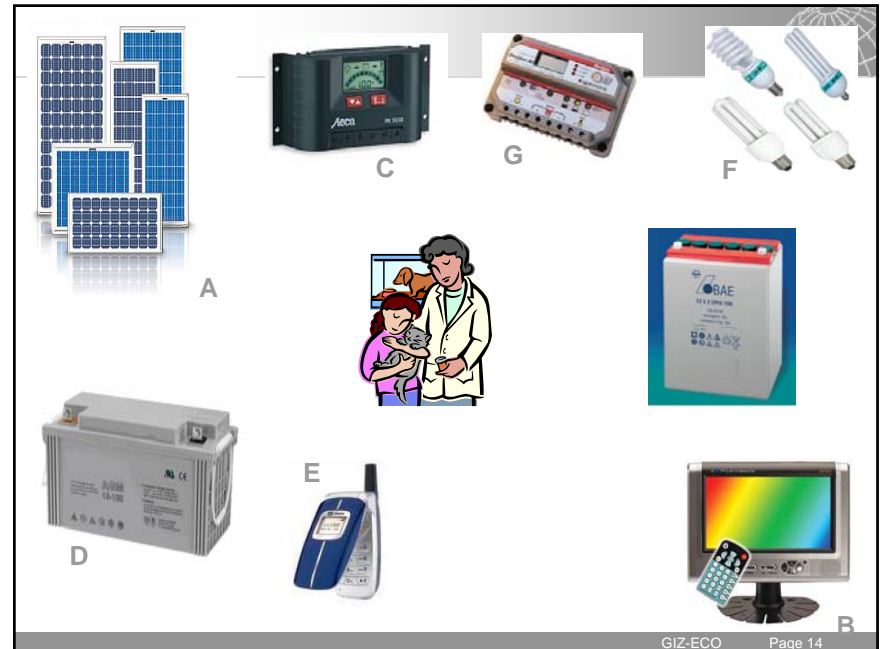


Solar System could be used

1. For individual houses / business
2. For group of houses / businesses
3. Integrated with other sources of energy (like generator, Grid...)

Main parts of a solar electric system:

1. **Module:** Module is an apparatus which convert the solar energy to electricity. The size of the module is determined by the size of the load we use and the length of time we utilize. It also depends on the geographical location and weather condition.
2. **Battery:** Battery is an apparatus which store the generated electrical energy . The size of the battery is determined by the size of the load we use and the length of time we utilize. It also depends on the geographical location and weather condition.
3. **Regulator or charge controller:** Regulator is the brain of the solar system, its main task is to manage the battery and load
4. **Loads:** Are apparatuses which converts the electrical energy produced to other forms like light, information through lamps, radio and TV .
5. **Electric connectors and controllers :** these are the one who connect components and protect the components and electrical instillation including the human being. Controllers also allow us to operate the apparatuses.
6. **Customer of the system:** these are the people who benefit form the solar system owners, residences and nurses . . .





Advantages and limitations of Solar PV Sys.

Advantages	Limitations
<ul style="list-style-type: none">▪The source of the energy is free▪It require no fuel and dose not affect health due to smoke▪It requires less maintenance in comparison with diesel generator▪It can be designed and installed based on the demand and the purchasing power of customer▪It is free from risk of fire in comparison with open fire and kuraz	<ul style="list-style-type: none">▪Relatively huge initial cost▪It require storing apparatus and it is expensive▪Designing and installing work force availability is limitation▪It requires a close attention and mind set of owner (end User)



Solar electric system utilization,
preventive maintenance and repair



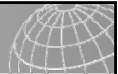
Solar system components are six:

They are:

Module, battery, regulator, electric wires and cables, protection devices and the client.

Thus:

The scope of our utilization, preventive maintenance and repair should address all of them.



Preventive maintenance

- An effective Preventive Maintenance activity help to avoid accidents and breakdowns
- A system which is designed and installed properly usually do not fail easily but, It require a minimal but continuous service and follow up
- The main task required is to follow up the components from dirt and external interference of any sort



Follow up

Module Follow-Up

- Protect the module from shadow of any sort
- Clean the top of the module from dirt (dust, bird litter...)
- Prevent the module top from scratch
- Prevent the underneath of the module from bird and rat nest

Battery Follow-Up

- Check the terminals of the batteries
- Clean the surrounding of the battery and its room
- Make sure batteries did not get direct sun light







Cable, wire and controllers follow up

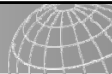
- Electric switch, sockets cables and wire which are installed properly as per the standard usually do not cause problems but require a follow-up
- The follow-ups are:
 - *For sockets and switches:*
 - *For cables and wires:*
 - *For fuses and circuit breakers:*
 - *For earthing rod and wires:*



Follow-up

Regulator follow up

Client follow up

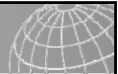


Electrical loads/ apparatuses

- *Electrical loads (apparatuses) which are designed for the system or considered at the time of the design usually do not cause problem.*
- *But loads introduced with out checking the situation at hand will cause problems*

- *The follow-up for lamps and other loads*

Follow up sheets



- One of the requirement for a well performing solar system is the level of involvement of the owner in managing the installed system.

To make this possible:

- an awareness training for owners of the system needs to be delivered from time to time
- all documents of the installed system needs to be kept properly
- a follow up document needs to be filled and kept properly



Small things can cause failure of a system

Therefore we have to know certain points to maintain a system

- *the weather condition of the previous week*
- *PV module situation (shadow, break down, loss connection ...)*
- *the battery situation (over discharged, loss/disconnection,*
- *conditions of fuse , circuit breakers and other controllers*
- *conditions of cables and wires*
- *Health condition of loads*

**After checking all these,
After taking the proper measures (to bring the system to the normal condition) ??????????**



Conclusion

- Special attention needs to be given when designing and installing of a solar electric system
- A close follow-up needs to be given to each component of a solar system
- Follow-up and maintenance of components should be made with proper attention and care
- The follow-up documents needs to be updated and filled with maximum care
- Report about the functionality and failure needs to be made continually and automatically
- Introducing the system to new comers is important



Thank You



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