To Identify Global Solar Radiation Areas for Improving and Predicting the Solar Resources

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Abstract **—** Solar energy is one of the most renewable energy which provides lot of application implementation such as water resources, forestry resources, meteorology, agriculture and solar energy. This paper proposes the methods of calculating the solar radiation level and radiation areas on the earth. This method will predict lot of application implementation methodology to improve the usage of solar resources. The solar radiation data are collected from different meteorology station of different countries. This information is collectively used for different implementations of solar application.

Keywords— solar energy, solar radiation mapping model, improving solar application, cloud

I.INTRODUCTION

The solar energy is the most important for the survival of life and also for the earth. The solar radiation is comes from the sun only the 30% of the energy is reflected back to the space and the remaining energy are consumed by the earth and some other intermediate layers of the ionosphere. The radiation of the sun light is called solar energy which is used for many purposes such as solar electric energy, solar water heater, and some other solar energy based automobiles. The solar energy is one of the most renewable resources which must be utilized in efficient manner. The solar radiation mapping models are used for identifying the radiation area and also measure the radiation levels. The globalized meteorology information is used for improving the utilization of the solar energy. The most common application of the solar radiation mapping is analysing the climate condition such as temperature, pressure, humidity and snow cover of the given area. The need of solar radiation application is for improving the efficiency of usage of solar energy to produce the electrical energy. The solar energy is a renewable resource which provides a million or trillion mega watt power to the world. The remaining section will describes the basic information of solar and overview of solar radiation mapping technique.

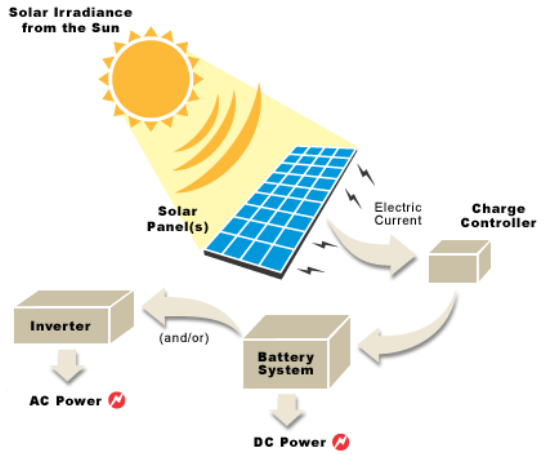
II. SOLAR ENERGY

The solar energy is a renewable energy resource, which is the light directly comes from the sun. There is lot of solar energy based applications and implementations such as solar water heater, solar based artificial photosynthesis, solar electricity and solar based automotives. The solar technologies are characterized as two types one is active and another one is passive solar technology which is categorized as a way of conserving the solar energy. Solar thermal collector and solar photovoltaic to consume the solar energy and the passive solar technologies are effective use of solar energy to some other usages such as lighting infrastructure using sunlight.

There are two methods to convert the solar energy in to electrical energy, by using photovoltaic's which produce photoelectric effects. Another one method is consuming the sunlight using lenses or a mirror to reduce the mass coverage of sunlight radiation area into minor spot to increasing the consumption of solar energy. The solar panel consists of large number of photovoltaic cells which produce the photoelectric effects the result is production of electrical energy. Some of the advantages of solar energy are as follows

- Renewable energy resource
- It don't cause pollution
- It can be used for low power consumption device

Fig.1 Solar Energy System



III. SOLAR RADIATION MAPPING

Solar radiation is the sunlight which is directly radiates its energy to the earth surface the solar radiation consist of ultraviolet rays, visible light and infrared rays. The three components of solar radiation are direct radiation, diffuse radiation and global solar radiation. The direct radiation is the radiation which is comes parallel to the earth without any noise and changes in radiation. The diffusion radiation is which the radiation is distorted by the atmosphere and clouds and the third one is the combined radiation of direct and diffused radiation in horizontal to the earth surface. The solar radiation measurement is most important to take decisions in field of renewable energy resources and also for research, determination of optimum location. The equipments used for solar radiation measurement is pyranometer and pyerheliometer.

Fig.2 Pyranometer and Pyerheliometer

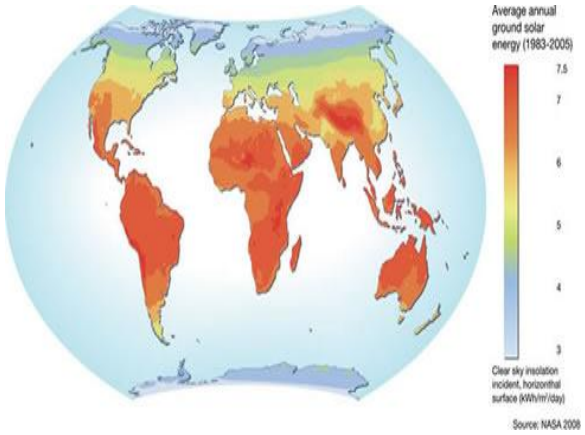
IV. SOLAR RADIATION MAPPING TECHNIQUE

The globalized solar radiation maps helps to promote the solar energy conservation. To predict the present concern of the solar radiation we can use the past measurement. The radiation is classified as shortwave radiation and long wave radiation. The wave length range of short wave radiation is 0.0 to 3micro meter and for the long wave radiation is 3micro meter. The process of solar radiation mapping involves the following

- Data gathering
- Analysis
- Predicting the results
- Implementing the actions
- Decision making with the mapped information

Topography is one of the major models for the solar radiation mapping on the earth location. The topography model can identify the variation among the slope, elevation, orientation and shadowing. Under clear sky condition the variation in illumination will affect the variation in radiation map and radiation reflection for each point is calculated. Digital elevation and surface reflectance data are needed for the topographic models.

Fig.3 Global solar irradiance



The geostationary satellite provides continuous spatial information to the ground station (Meteorology station). The satellite spatial information process provides less accurate information; the European meteorology satellite which provides more accurate information by extracting the vast spatial information.

V. GEOGRAPHICAL INFORMATION SYSTEM

The geographic information system is a computer device which provides a visualization of geological images, analyzing spatial data, patterns and relationship among the spatial data. With the help of GIS information and visualization we can develop a solar radiation mapping model. This model contains a topographic image, based on those information and several physical parameters we can calculate the radiation pattern of the solar on the earth surface.

VI. SYSTEM OVERVIEW

The GIS provides a visualization of spatial information. With the help of GIS we can develop a topographic model and to calculate the solar radiation information of the given area. The paper proposes the globalized solar radiation system by integrating the GIS system of the different countries. For integrating the GIS we need a mass storage system, for that the cloud computing environment is used, which provides highly scalable and secure storage and globalized access through the internet. The Information collected from the different countries is stored in the centralized cloud storage by virtualization concept. There are different services that the cloud provides such as software as a service, platform as a service, storage as a service and infrastructure as a service. This paper uses the storage as a service and infrastructure as a service. To calculate the solar radiation the pyranometer is used which calculates the solar radiation level and convert this in to appropriate information to the meteorology station. This information is stored on the local database of the meteorology station and this information is furtherly updated by the GIS of the particular country. The GIS of all countries are connected through the GIS satellite all the calculated radiation levels are reviewed and used for future implementations and decision making about solar energy generation.

VII. CONCLUSION

The proposed system of solar radiation pattern calculation method integrates all over the countries so almost cover the 80% of the earth surface. So that we can easily predict the climate conditions and other natural disasters such as heavy rain, cyclones, floods etc. And also this system will useful to improve the solar energy production by help to make the decisions as where to locate the solar panels. There are lot of interoperability problem are raised in this system. This drawback is taken as future work to improve the system performance without interoperability.

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