Administración y reducción de costos a través de la energía solar en el CUCOSTA-UdeG y en los hogares de Puerto Vallarta, Jalisco

Management and reduced costs through solar energy in the CUCOSTA-Guadalajara and homes of Puerto Vallarta, Jalisco

Administração e reduzir os custos através de energia solar no CUCOSTA-UdeG e casas em Puerto Vallarta, Jalisco

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Resumen

Lo transcendental de este estudio, consiste en divulgar en la Sociedad en General en nuestro país, pero sobre todo a la Comunidad Vallartense de los beneficios que se obtienen utilizando la Energía Solar, transformándola en Energía Eléctrica sin efectos de contaminación ambiental, para ser aplicada en el Centro Universitario de la Costa y en los Hogares de Puerto Vallarta, Jalisco. Es importante dar a conocer a los usuarios de la energía eléctrica, los consumos de watts requeridos en cualquier aparato electrodoméstico u equipo de oficina.

Las incubadoras juegan un papel positivo en materia energética, así como en la obtención de apoyos económicos a través de las PIMEX y MIPYMEX que promueve el Gobierno Federal**,** Estatal y Municipal.

Los estudiantes de las materias de Costos Básicos, Análisis Integral de los Elementos del Costo de la Carrera de la Licenciatura en Contaduría Pública del Centro Universitario de la Costa de la Universidad de Guadalajara realizan Proyectos en materia de Transformación de la energía solar a eléctrica, de ensamblaje y costeo de paneles solares.

La Comisión Federal de Electricidad modifica a través de la Comisión Reguladora de Electricidad (CRE) Otorgar la opción de generar su propia energía, tanto en los comercios, residencias e industrias sin contaminar el medio ambiente generando energía limpia a través de paneles solares.

Palabras clave: administración, energía solar, costo, reducción, CUCOSTA-UdeG, CFE.

Abstract

The transcendental of this study, is to disclose to the society in General in our country, but above all to the Puerto Vallarta community, of the benefits that are obtained using Solar Energy, transforming it into electrical energy without the effects of environmental pollution, to be applied in La Costa University Center and in the homes of Puerto Vallarta, Jalisco. It is important to inform users of electric power consumption in watts required in any household appliance or office equipment.

The hatcheries play a positive role in the energy field, as well as in obtaining economic support through the PIMEX and MIPYMEX promoted by the Federal, State and Municipal Government.

Projects carried out by students in matters of Basic Costs, Analysis Integral of the Elements of the Cost of the Career of the Bachelor's Degree in Public Accounting of the Costa University Centre of the University of Guadalajara in the field of transformation of solar energy to electrical, assembly and costing of solar panels.

The Federal Electricity Commission modifies through the Electricity Regulatory Commission (CRE by its name in Spanish) give the option of generating their own energy, both in shops, homes and industries without polluting the environment generate clean energy through solar panels.

Key words: management, solar energy, cost, reduction, CUCOSTA-UdeG, CFE.

Resumo

O transcendental deste estudo é disseminar na sociedade em geral no nosso país, mas especialmente a Comunidade Vallartense das vantagens da utilização de energia solar, transformando-a em energia elétrica, sem efeitos da poluição ambiental, a ser aplicado em Centro Universitário da Costa e nas casas de Puerto Vallarta, Jalisco. É importante informar os usuários de eletricidade, o consumo de watts necessários em qualquer eletrodomésticos ou equipamentos de escritório.

Incubadoras desempenhar um papel positivo no campo da energia, bem como na obtenção de apoio financeiro através do PIMEX e MIPYMEX promovido pelo Federal, Estadual e Municipal.

Estudantes matérias custos básicos, análise abrangente dos elementos de custo Carreira grau na contabilidade do Centro Universitário da Costa, da Universidade de Guadalajara realizar projectos no domínio da transformação da energia solar para elétrica, montagem e custeio de painéis solares.

A Comissão Federal de Eletricidade modificado através da Comissão Nacional de Energia Elétrica (CRE) Fornecer a opção de gerar sua própria energia, tanto em lojas, residências e indústrias poluem o meio ambiente sem gerar energia limpa através de painéis solares.

Palavras-chave: gestão, energia solar, redução de custos, CUCOSTA-UdeG, CFE.

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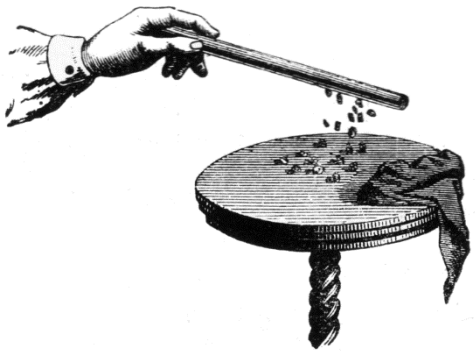
Introduction

Electricity is one of the main forms of energy used in the world today. Without it there would be adequate in the planet lighting, nor nor radio, television or telephone service; the people, of course, would have to do without electrical appliances, which have become an integral part of everyday life. Without light, could not be used household items such as fridge, iron, Blender (so useful in the preparation of food), washing clothes, dryer, as well as the foci of the bedrooms, the room, the dining room, or devices such as the computer or cell phone. Electricity is also used in transport: trolleybuses, sea-going vessels, aircraft and even modern drones, so useful in different areas (Mileaf, 1997).

Background

It was the Greeks who discovered for more than two thousand years the concept of electricity. To do this they used the method of observation and used a material known as **amber**, which was loaded with a mysterious force after being rubbed against other materials. Amber attracted towards certain light materials as dry leaves and chip. Amber the Greeks called Elektron, Word from which derived the concept of electricity.

Figure 1: Amber attraction



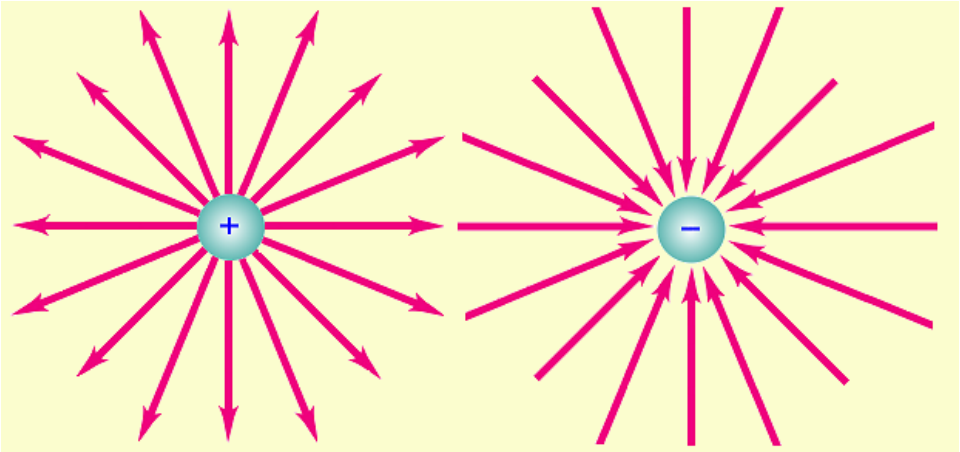
Source: WikiBooks, 2015

In 1600, William Gilbert classified materials in electric and non-electric, and according to their behavior in amber or not amber.

In 1733, another French researcher, Charles DuFay, used the method of observation on a piece of glass. Since this was electrically charged energy and attracted some objects, it was determined that there were two types of energy.

Approximately in the middle of the 18th century, Benjamín Franklin differed what today is known as positive electricity and negative electricity. At the time, Franklin pointed out that electricity was like a fluid with positive or negative charge.

Figure 2: Positive and negative electricity representation



Source: Wikipedia, 2015

Currently, science considers that electricity generates very small particles called electrons and protons. These are too small to be able to see them with the naked eye.

Matter is any object that has a weight and occupies space; May be in the form of a solid, liquid or gas; For example, stone, wood and metal are forms of solid matter. On the other hand, there are liquids: water, alcohol, gasoline. And the gases: oxygen, hydrogen and carbon dioxide.

Here are definitions of concepts such as matter, compounds, molecule, atom, nucleus, proton, and electron (Mileaf, 1997):

> **Elements:** Are the basic materials that make up all matter, oxygen and hydrogen are elements, as are aluminum, copper, silver, gold and mercury. They are part of the more than 100 elements that have been discovered, of which 92 are natural and the rest artificial, that is, they have been made by man. In recent years a number of new elements have been obtained and researchers are expected to continue to discover more. It should be noted that everything around us is made up of elements, but these can not be produced by a simple chemical combination, nor by the separation of other elements.

Compounds: there are many more materials than elements, but also the elements can be combined to produce materials whose characteristics are totally different from those of the constituent elements. For example, water is a compound containing the elements hydrogen and oxygen, while table salt is composed of sodium and chlorine.

Molecule: is a smaller particle to which a compound can be reduced before it decomposes into its elements. For example, we divide a bead of table salt into two successively until we obtain a smaller piece, which we call the salt molecule, and if we divide it once again, the salt decomposes into its elements. A grain of salt can be reduced to a molecule of salt and thus we would get sodium and chlorine.

Atom: this element can be reduced to a smaller particle and still retain its properties, example of it is the water that when reduced to a drop appears hydrogen and oxygen in her. In addition, the atom is formed by three types of sub-atomic particles, which are important for the study of the electricity: electrons, protons and neutrons; These last two are in the center of the nucleus of the atom, whereas the electrons turn in orbits around the nucleus.

Nucleus: is the central part of the atom and contains the protons and neutrons of this. An example of content: the nucleus of a hydrogen atom contains a proton, oxygen contains 8, copper 29, silver 47 and gold 79, this is how to identify the elements, ie by their atomic numbers. The atomic number is the number of protons that each atom contains in its nucleus.

Proton: The nucleus of an atom contains neutrons (neutrons) and protons (positives). The nucleus of any atom is always positive.

Electron: this has a diameter three times greater than that of the proton, or approximately 5,588 trillionths of a millimeter; But it is 1 840 times lighter than the proton; Electrons are easier to move and are particles that actively participate in the flow or transfer of electrical energy; The electrons rotate in

> orbits around a nucleus of an atom and have negative electric charge. This charge comes from everywhere radially, directly to the electron.

In 1839, the French physicist Alexandre-Edmund Becquerel discovered the photovoltaic effect, which is fundamental for the development of photoelectric cells. Photovoltaic solar energy is a source of energy that produces electricity of renewable origin that is obtained directly from solar radiation by means of a semiconductor device called photovoltaic cell, or by deposition of metals on a substrate called thin film solar cell.

Justification

So far there is very little information available in books on the assembly of solar lamps; However, there is sufficient information on internet sites. There you can find the most relevant information to carry out solar projects and use it in the matters of Basic Costs and Comprehensive Analysis of the Cost Elements.

In this way, students will be able to be competitive in the area of costing, according to the curricular reform of the curriculum of the licenciatura degree in public accounting of the fifth and sixth semester of the University Center of the Coast of the University of Guadalajara.

These projects can generate in the students an industrial and commercial activity through the incubators and that way they will be able to receive resources through the PIMEX and MIPYMEX of the federal, state and municipal governments. What is intended is for the student to become a competitive entrepreneur.
goals

This project aims to collaborate in the innovation of the use of electric energy through solar energy in the corridors of the University Center of the Coast of the University of Guadalajara and in the homes located in Puerto Vallarta, Jalisco. It also aims to generate in the students of the fifth semester of the degree in public accounting, specifically with the subject of Basic Costs, learning to assemble and pay for solar lamps. This is a tool that offers business opportunities in students, economic benefits for homes and, of course, reduction in electricity consumption in CUCOSTA.

General objective

The student is able to express critical judgments about the types of industry and their costs, basic concepts and elements that compose it, as well as a system of costs from the perspective of an industrial plant. In addition, it applies its knowledge about cost elements in solar projects.

Particular objectives

- Know the importance of the classification of the companies, their procedure of activities and the application of the cost systems. Analyze the different types of companies.
- Define the elements of cost as direct raw material, direct labor and indirect manufacturing costs in electric energy.
- Discover the records that must be met to be considered raw material.
- Analyze the requirements to be fulfilled for your direct labor.
- Develop the design of solar panels through a workshop course.

Problem Statement

In the University Center of the University of Guadalajara, located in Puerto Vallarta, Jalisco, and in most homes, traditional electricity is used, which generates high costs in consumption in KWH and in economic expenditure. Taking into account this latest concept of high costs in terms of energy consumption in the corridors of the Campus, it is possible to reduce the consumption of electricity.

Theoretical framework

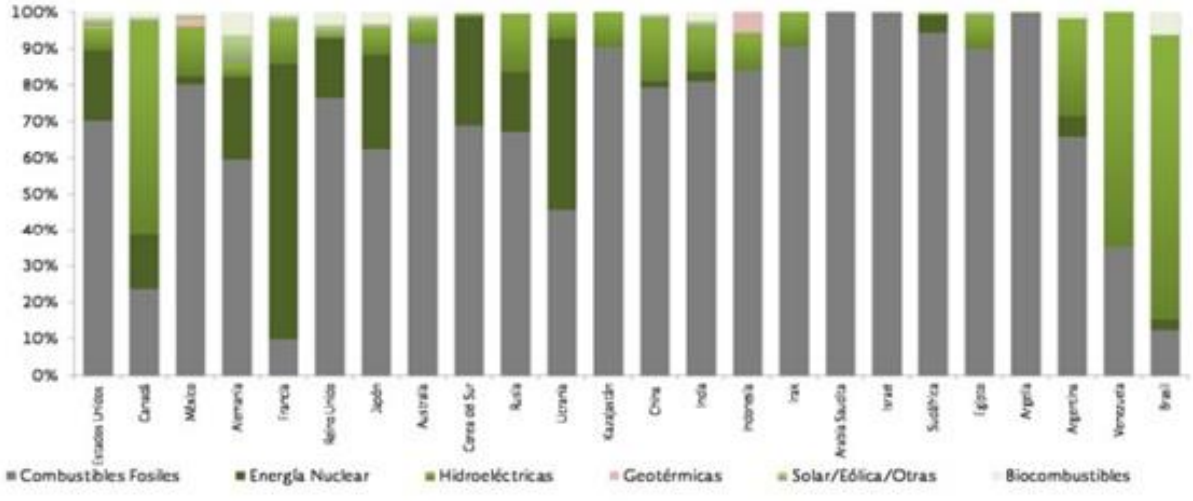
Mexico occupies worldwide a place in the generation of electricity according to the information provided by the OECD and according to studies carried out by the Secretariat of Energy in the Forecast of the Electricity Sector 2013-2027. This study is based on expectations of economic growth and evolution of the economic prices of fuels approved for 2012, which also presents the estimates and expected evolution of demand and energy

consumption for the period of interest by sector Economic, as well as by control area of the national electricity system.

All countries in the world in the field of electricity depend on fossil fuels such as coal and petroleum products; Its consumption is around 50% above its primary source of generation. During the last decades, the development of electricity has grown through the use of alternative fuels such as natural gas and nuclear power.

In terms of energy, the European index in 2010 fell from 1.4% to 1%, while in North America it grew from 0.9% to 1.12%. These studies show that the United States in terms of electricity generation currently occupies the first place, so it has electricity consumption of 4,353.4 TWh, while Mexico only has 271.1 TWh, of which 217.5 TWh are provided Of fossil fuels: gas and oil. On the other hand, 37.1 of the hydroelectric plants with 5.9 TWh are obtained through nuclear technology. There are other countries, which are not members of the OECD, that are more dependent on fossil fuels, in particular coal, followed by natural gas and oil derivatives. These countries are Saudi Arabia, South Africa, Iraq and Algeria, among others. Next, we show the following graph (Secretaría de Energía, 2013).

Figure 3: Primary sources and fuels for electricity generation in 2010



Source: Información de electricidad 2013, Secretaría de Energía

In order to obtain electrical energy through the solar energy the radiations that the Sun emits directly towards the Earth are captured; On the other hand, there is diffuse radiation, which is when the rays are dispersed in the atmosphere, and the albedo radiation, which is

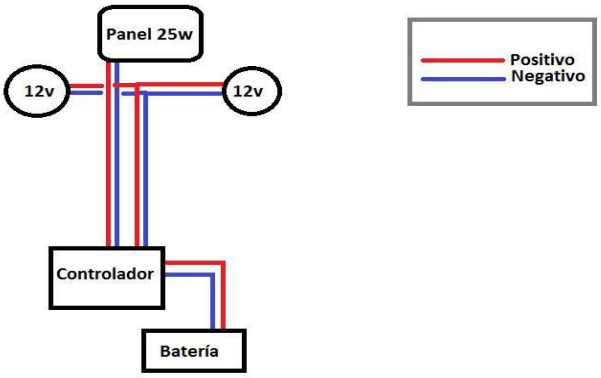
reflected in the terrestrial surface towards the energy receiver. All these forms of energy are called global radiation.

Now let's see the transformation of solar energy into electrical energy through the design of a solar panel. This is formed by semiconductor materials called photovoltaic cell, where fields of electricity are created. The most used elements are those of Silicon (Types of Energy, 2015).

When the sun's rays hit the cells, the P-N junction of the semiconductors together with their conductive metal helps produce energy. At this juncture, the PN junction are positive and negative charges that produce electric current, due to a potential difference that is created when the cell is illuminated (idem).

When the cell short-circuits (that is, when the P and N regions are joined by a zero-resistance conductor), electrons in the N region travel through the conductor and join the holes in the P region, producing Electricity thanks to the flow of electrons. This current will be maintained while the cell is illuminated (idem).

Figure 4: Representation of the electricity production flow



Source: Asociación Mexicana de Energía

Table 1: Consumption per appliance kilowatts per hour

Aparato	Potencia (Promedio) Watts	Tiempo de uso al día (Periodos Típicos)	Tiempo de uso al mes (horas)	Consumo mensual Kilowatts-hora (Watts/1000) x hora
CONSUMO BAJO				
Abrelatas	60	15 min/semana	1	0.06
Exprimidores de cítricos	30	10 min/dia	5	0.15
Videocassetera o DVD	25	3hr 4vec/sem	48	1.2
Extractores de frutas y legumbres	300	10 min/día	5	1.6
Batidora	200	1hr 2vec/sem	8	1.8
Licuadora baja potencia	350	10 min/día	5	2
Licuadora mediana potencia	400	10 min/día	5	2
Máquina de coser	125	2hr 2vec/sem	16	2.3
Tocadiscos de acetatos	75	1 hr/día	30	2.5
Licuadora alta potencia	500	10 min/día	5	4
Bomba de agua	400	20 min/día	10	5
Tostadora	1000	10min.diarios	5	5
Radio grabadora	40	4 hrs.diarias	120	8
Secadora de pelo	1600	10 min/día	5	9
Estéreo musical	75	4 hrs.diarias	120	9
Tv color (13-17 pulg)	50	6 hrs.diarias	180	10
Horno eléctrico	1000	15 min/día	10	12
Horno de microondas	1200	15 min/día	10	13
Lavadora automática	400	4hr 2vec/sem	32	13
Tv color (19-21 pulg)	70	6 hrs.diarias	180	13
Aspiradora horizontal	800	2hr 2vec/sem	16	13
Aspiradora vertical	1000	2hr 2vec/sem	16	16
Ventilador de mesa	65	8 hrs.diarias	240	16
Ventilador de techo sin lámparas	65	8 hrs.diarias	240	16
Ventilador de pedestal o torre	70	8 hrs.diarias	240	17
Focos fluorescentes (8 de 15W c/u)	120	5 hrs.diarias	150	18
CONSUMO MEDIO				
TV color (24-29 pulg)	120	6 hrs.diarias	180	22
Cafetera	750	1 hr.diaria	30	23
Plancha	1000	3hr 2vec/sem	24	24
Ventilador de piso	125	8 hrs.diarias	240	30
Estación de juegos	250	4 hora/dia	120	30
Equipo de cómputo	300	4 hora/dia	120	36
TV color (32-43pulg)	250	6 hrs.diarias	180	45
Refrigerador (11-12 pies cúbicos)	250	8 hrs/dia	240	60
TV color (43-50 pulg. Plasma)	360	6 hrs.diarias	180	65
Refrigerador(14-16 pies cúbicos)	290	8 hrs/dia	240	70
c/u)	480	5 hr.diarias	150	72
Refrigerador (18-22 pies cúbicos)	375	8 hrs/dia	240	90
Secadora eléctrica de ropa	5600	4 hrs.semana	16	90
Congelador	400	8 hrs/día	240	96
CONSUMO ALTO				
Refrigerador de más de 10 años	500	9 hrs/día	240	120
Refrigerador(25-27 pies cúbicos)	650	8 hrs/día	240	156
Calentador de aire	1500	4 hrs/día	120	180
Aire lavado (cooler) mediano	400	12 hrs.diarias	360	144
Aire lavado (cooler) grande	600	12 hrs.diarias	360	216
Aparato divido (minisplit) 1 ton.	1160	8 hrs.diarias	240	278
Aparato divido (minisplit) 1.5 ton.	1680	8 hrs.diarias	240	403

Aparato divido (minisplit) 2 ton.	2280	8 hrs.diarias	240	547
Aparato de ventana 1 ton. Nuevo	1200	8 hrs.diarias	240	288
Aparato de ventana 1 ton. Antiguo	1850	10 hrs.diarias	300	555
Aparato de ventana 1.5 ton. Nuevo	1800	8 hrs.diarias	240	432
Aparato de ventana 1.5 ton. Antiguo	2250	10 hrs.diarias	300	675
Aparato de ventana 2 ton. Nuevo	2450	8 hrs.diarias	240	588
Aparato de ventana 2 ton. Antiguo	3200	10 hrs.diarias	300	960
Refrigeración central 3 ton. Nuevo	3350	8 hrs.diarias	240	804
Refrigeración central 3 ton. Antiguo	4450	10 hrs.diarias	300	1335
Refrigeración central 4 ton. Nuevo	4250	8 hrs.diarias	240	1020
Refrigeración central 4 ton. Antiguo	6500	10 hrs.diarias	300	1950
Refrigeración central 5 ton. Nuevo	5250	8 hrs.diarias	240	1260
Refrigeración central 5 ton. Antiguo	7900	10 hrs.diarias	300	2370

Source: Comisión Federal de Electricidad

Figure 5: House with solar panels

Fuente: planosde.net, 2015

Results

Alejandro Aleman, a researcher at Tecnológico de Monterrey, Campus Estado de México, points out that the sun is currently one of the cleanest but least exploited energy resources. Solar energy can easily be used to produce electricity, but it is expensive. This is done by the use of photovoltaic panels, which are a set of semiconductor cells reactive to light that emit electrons that in turn generate a current that produces electrical energy. It is important to know how to use this electric energy because it can accommodate sustainable development in our country: it is one of the cleanest ways to generate energy.

Another important feature of this system is its ability to store energy, which is not the case with other forms of energy generation. The energy generated with the help of the solar

panel can be stored in electrolytic batteries for future use; This makes the solar panels are mainly used for the recharge of batteries during the day and to use the energy stored at night.

In order to use these devices it is necessary to convert to AC power to the direct current emitted by the module and stored in the battery. This is done by an inverter, which is a device that allows the direct current signal to be converted into an AC signal.

It is important to consider the use of alternative energy for the development of electronic systems, since this way supports the preservation of the environment and contributes to rural populations enjoy this basic resource. Therefore, energy generation systems that pollute very little are used.

Table 2: Ratio of manufacturing cost of luminaire

Relación del costo de fabricación Iluminaria			
Descripción	Característica	Unidad	Costo
Batería	Adaptada para panel	1	$ 299.00
Cables	Todo el sistema de cableado	N/A	$ 135.00
Placas y electrónicos	Todo para fabricar panel y bombillas	1 Juego	$ 698.00
Base luminaria	Acero y caja para batería	1	$ 450.00
Candado	Candado con llaves	1	$ 100.00
Mano de obra	Por toda la fabricación	N/A	$ 700.00
Pintura en aerosol	Bote	2	$ 78.00
TOTAL			$ 2 460.00

Source: elaboración propia.

Conclusions

The location of the house or any installation that supplies electricity with solar energy has a tremendous influence on the cost of the solution and makes the difference between making it competitive or not regarding the connection to the electricity grid. In the case of the consumption of electric energy in the corridors of the University Center of the Coast of the University of Guadalajara in Puerto Vallarta, Jalisco, has 23 poles of two poles each post with a consumption of 5 watts per pole, the change is substantial Since 3 watts per pole are consumed, then we would be talking about a saving of 40% of electric energy consumption when using solar energy, in the case of the home the calculation of the

consumption of watts will vary according to the equipment that uses and of course Which will be based on the base consumption, ie if it exceeds the ceiling, then the subsidy will be affected and will affect the consumption and payment of electricity.

In doing this work, we were able to realize the great difficulty of obtaining information on solar radiation. This information must be available so that the use of solar energy can be encouraged and facilitated.

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