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Continuous Power Supply from Solar Panel by using IRLED Lights

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Abstract

This study proposes the idea of a continuous power supply from solar panels utilising an artificial way of creating Infra-Red(IR).

The solar panel will produce energy even at night and on rainy days by implementing this design.The most significant drawback of a solar panel is that it cannot be utilised at night or if it is in direct sunlight. The aim of our idea is to reduce the drawbacks of solar panels. A Light Dependent Resistor (LDR) is utilized in this project for identifying whether it is morning or night and the analogue value detected is relayed to the PIC microcontroller. Only the necessary load will be on throughout the night hours, ensuring that the battery stays operational even at midnight. The IR Light Emitting Diodes (LEDs) on the inner side of the shutter, which is positioned on top of the frame, are illuminated at night. The shutter is opened and closed by a motor, which is controlled by a relay. An IoT module monitors the battery's charge and discharges conditions (ESP8266). The system's reliability and economic analysis have been presented

Keywords: IRLED,Lightdependent resistor,PIC microcontroller, IOT module

1. Introduction

In response to an ever-increasing population and standard of living, power demand has risen substantially. Traditional energy sources have been unable to meet rising electricity demand. Several experiments have been carried out to produce as much electricity from renewable resources as possible.

Solar electric systems transform the Sun's radiant radiation into electricity using solar cells. This is accomplished by the photovoltaic effect. Because a single solar cell only creates about 1-2 Watts of power, solar power panels must be assembled to generate additional power.When the sun shines on it, the solar panel should convert the light energy into electricity. This type of energy is known as photovoltaic energy. Solar electric systems convert the Sun's radiant energy into electricity using solar cells. This is accomplished through the photovoltaic effect.Because a single solar cell only creates about 1-2 Watts of power, solar power panels must be assembled to generate additional power. The solar panel should turn light energy into electricity when the sun shines on it. Photovoltaic energy is the name for this type of energy. A solar cell, commonly known as a photovoltaic cell (PV), is a device that uses the photoelectric effect to convert light into direct electricity. Charles Fritts invented the first solar cell in the 1880s.

Solar energy has grown in popularity for a multitude of purposes since then. This document gives a summary of the literature on the use of solar energy in street lighting. Table [1] shows the evolution of solar street lights with an energy management system.

A solar panel, an IR LED, a light-dependent resistor, a PIC microcontroller, an IoT board, four relays, and a motor are among the project's hardware components.

Using Arduino the performance of the solar panel is monitored and data is stored in the memory card for back up. [2][6][7][8].

A monitoring system for the solar panel with controlled current, voltage, and battery output power was devised using an ESP8266[3][16][17]

The significant electrical characteristics of solar cells can be predicted but due to environmental factors it may vary.[19][20][24]

Solar energy as shown online and tracked using IoT. [4][10][21][23]

This technology can be used in a variety of applications, such as solar street lamps, which can last longer during the night due to the system's simultaneous charging. [28][29][30]

2. Proposed system

The sun's rays are captured by the sun-oriented board during the day, stored in the battery, and employed as a load in the suggested system. In any case, the battery's stored energy is insufficient to meet the evening's heap requirements. As a result, infrared LEDs are employed to give illumination that can be used to generate power by the sunlight-based board. IR LEDs provide an extra source of capacity for the heap by supplying energy. The reason for this is because the battery's stored energy benefits the heap, just as the LEDs and IR beams keep the battery charged. The IR LEDs are placed in close proximity to the board that is powered by sunlight. The IR LEDs are connected to authentic and equal, and they are placed on the shade. With the help of a driver, the screen will be confined by an engine. During the day, the shade is left open to allow direct sunlight to fall on the board, generating power. The shade is drawn closer in the evening, and the IR LEDs are activated.The shade is controlled by the information provided by the LDR to the PIC regulator. The LDR works by using the power of light to modify the blockage. The voltage signal is converted from the differentiating obstacle. The voltage signal is then sent to the ADC. The LDR determines whether it is day or night and provides the PIC regulator with simple qualities. The Internet of Things is used to provide data about the charging and discharging states of the battery, which is displayed on the LCD.

3. Diagrammatic Representation

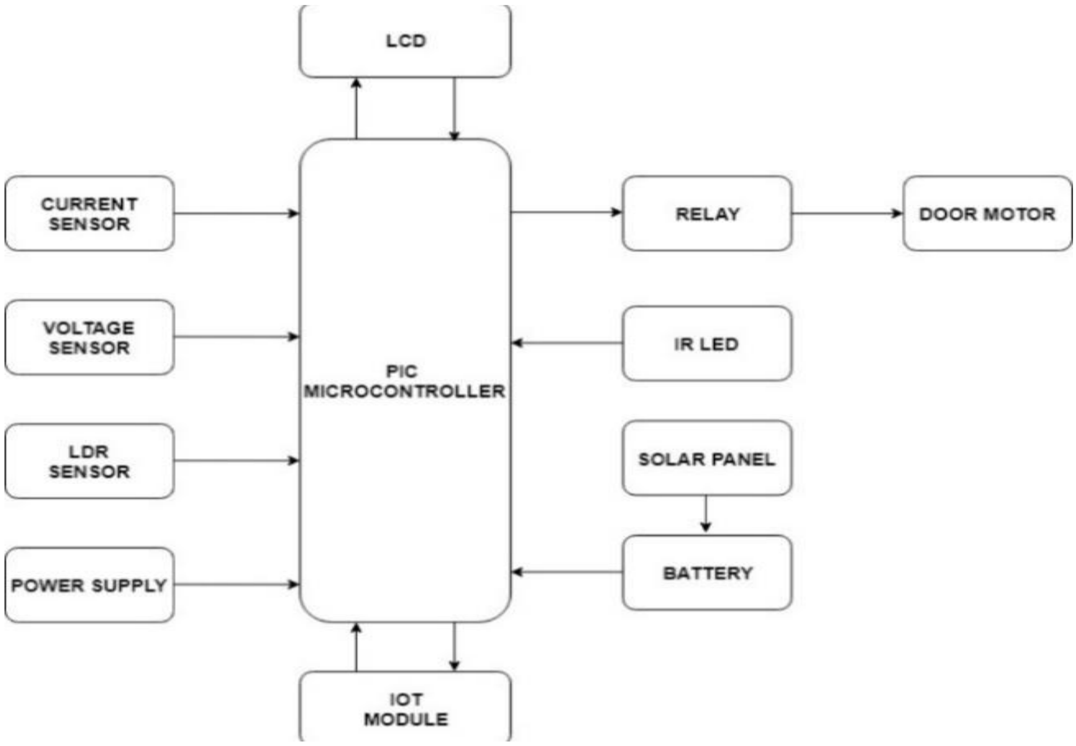

Fig 1 Block Diagram of the proposed system

The LDR determines whether it is day or night and provides this information to the controller as an analogue value. The resistance fluctuates as the quantity of light falling on the LDR changes. The LDR, LCD, and IoT are all powered by the controller, which is powered by the battery. To open and close the shutter, the driver circuit rotates the motor clockwise and anticlockwise.

4. Software simulation

The LDR faculties and delivers simple data to the microcontroller during the day, as shown in Fig. 2. According to the information provided, the regulator orders the engine to run, which is controlled by transfer and cutoff switches. The engine is powered by the hand-off, which allows it to pivot in a clockwise manner. As a result, it is possible to open the shade. The stock to the IR LEDs is promptly switched off using a switch once the LDR has delivered data to the regulator. The board appears to assist with daylight coordination when the shade is opened. The energy that hits the board is turned into electricity and supplied to the heap.

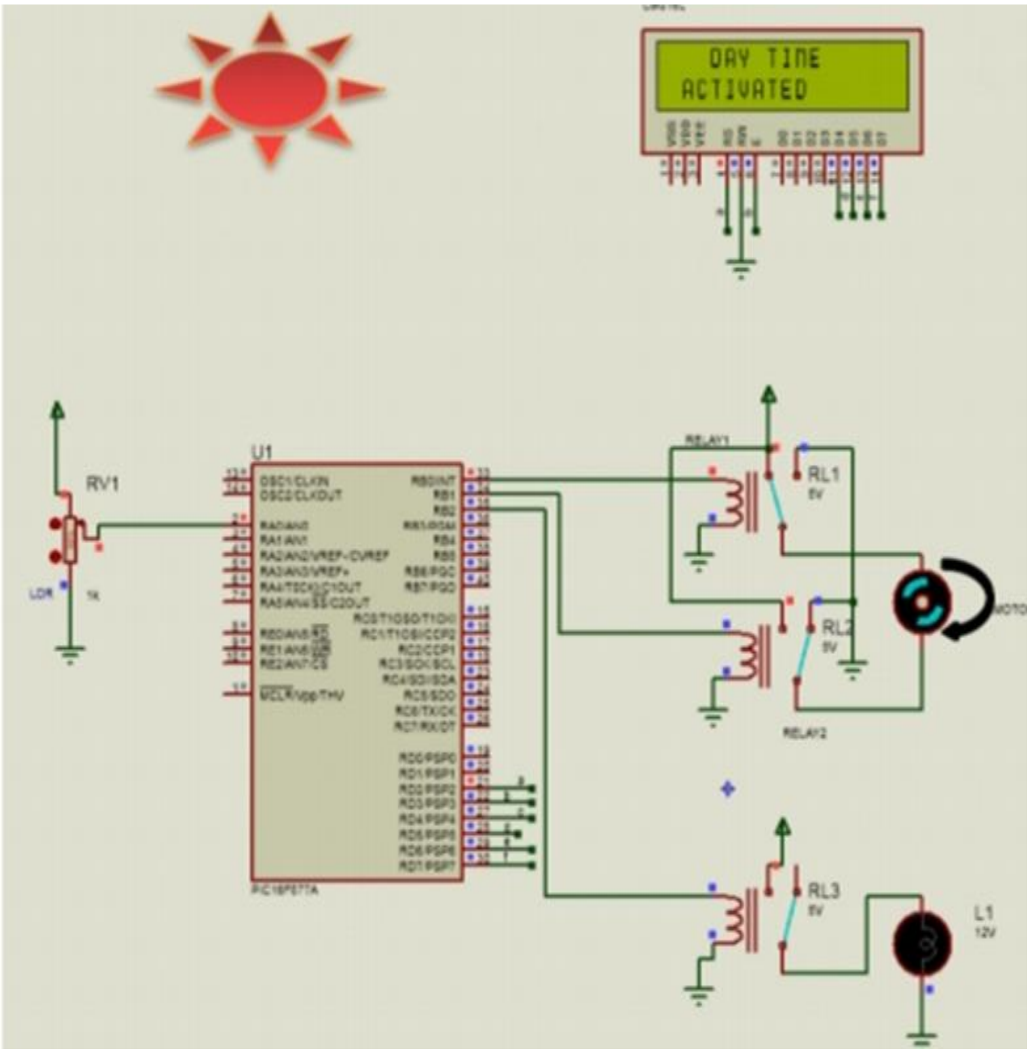

Fig 2. Daytime implementation schematic diagram

During the evening, as shown in Fig. 3. The LDR sends the data to the regulator is clear qualities as night. Using a hand-off turn, the regulator easily trains the engine to rotate anticlockwise to close the shade. When the shade is in close proximity to the floor, the regulator uses a transfer switch to provide power to the IR LEDs from the battery. Radiations are constantly illuminated by these infrared LEDs. The shade is closed to prevent the radiation from escaping. These rays cause electrons in the board to collide with openings and generate electricity. The heap receives this force from the battery.

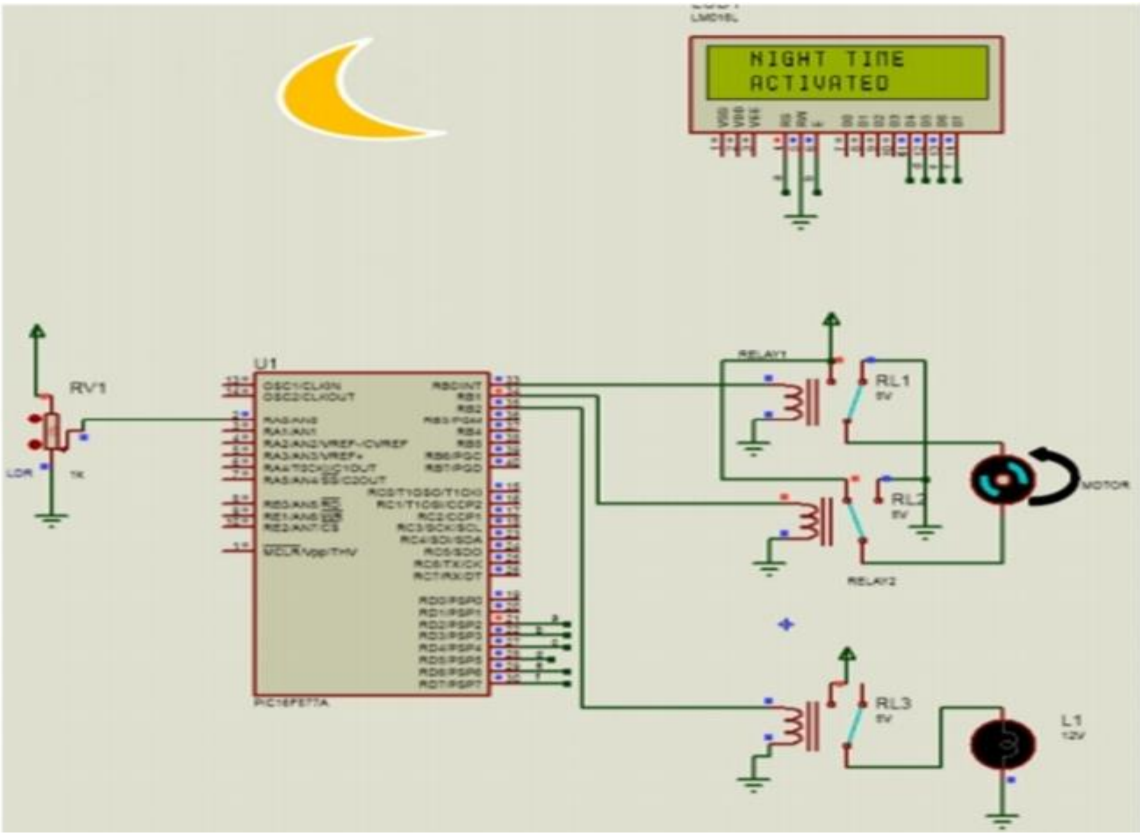

Fig 3: Night time implementation schematic diagram

Table1: Algorithm of the proposed work

Step -1:	Switch the kit on and take note down the LDR values.
Step -2:	Day time is activated only if the analogue values received by the PIC is greater than 200; otherwise, proceed to step 5.
Step -3:	“Daytime Implemented” is displayed on the LCD.
Step -4:	The driver circuit gives power to the motor, and it opens the shutter and traps and stores energy in the battery.
Step -5:	Night time is enabled only if the analogue value is less than 200.
Step -6:	“Night time Implemented” is displayed on the LCD.
Step -7:	The driver circuit provides power to the motor, which shuts the shutter and moves the IR LEDs closer to the panel.
Step -8:	Relay is used to turn on the IR LEDs.
Step -9:	When infrared rays strike the panel, the energy is caught and stored in the battery.
Step - 10:	When infrared rays strike the panel, the energy is caught and stored in the battery.

5. Hardware Implementation

It includes infrared LEDs rather than visible light, thus charging should be feasible in any case, including in the dark and in gloomy settings. As a result, the charging and releasing times can be reduced, and the result can be obtained even when there is no daylight. IR LEDs have a force admission of 0.386W, and the board yield is 0.5347W. Because the IR LEDs are placed so close to the board, the electromagnetic waves emitted by them are captured by the sun-powered board, resulting in a similar high yield. Daylight is made up of visible light, xbeams, infrared beams, ultraviolet beams, and radio waves. In general, IR and UV beams are trapped by solar-powered boards. When compared to other beams, UV has a stronger force. To create fake UV beams, we need high-powered equipment such as mercury lights, which are also harmful to the environment. As a result, the IR framework can be implemented with minimal effort.

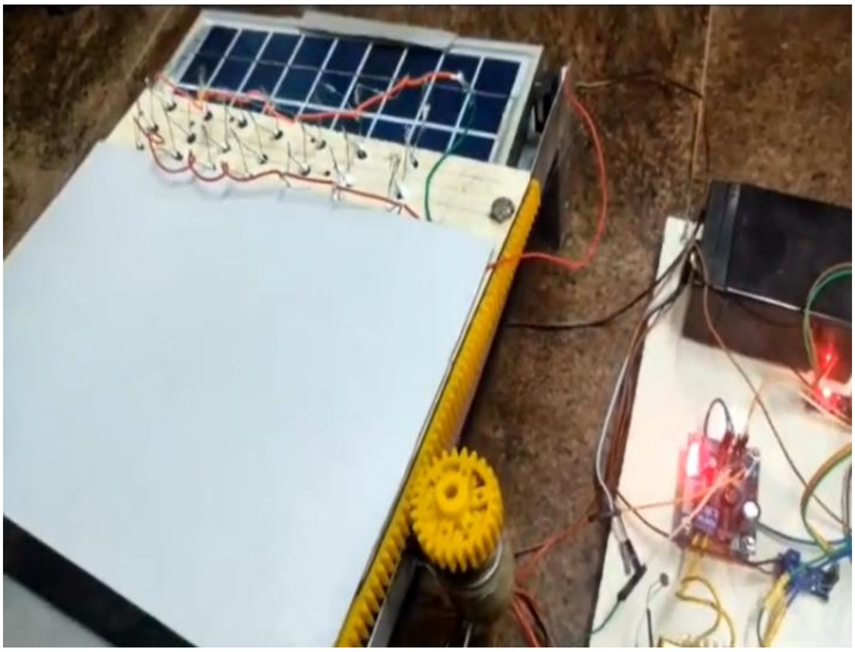

Fig4: Day time working module(Door open)

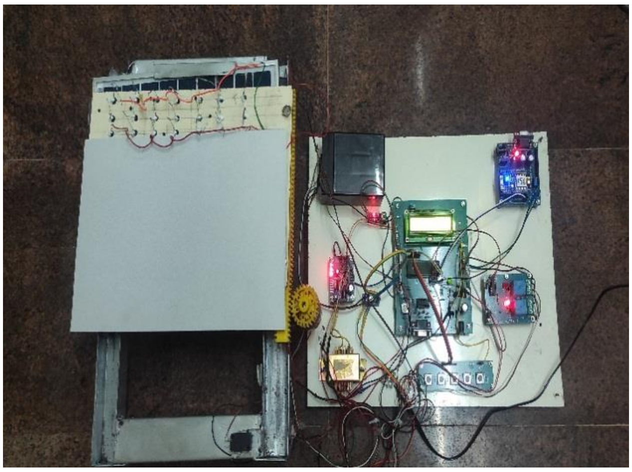

Fig5: Night time working module(Door close)

6. Analysis on results

Set-up performance :

Only under standard testing settings can the panel's maximum efficiency be obtained. Fig 6 and fig 7 predict the VI properties of the panel during the day and at night. 0.03A is given as input current to the IR LEDs According to the measurements, yet the output current from the panel is substantially higher. Figure 8 depicts the power and time curve for the panel's output power during the night.

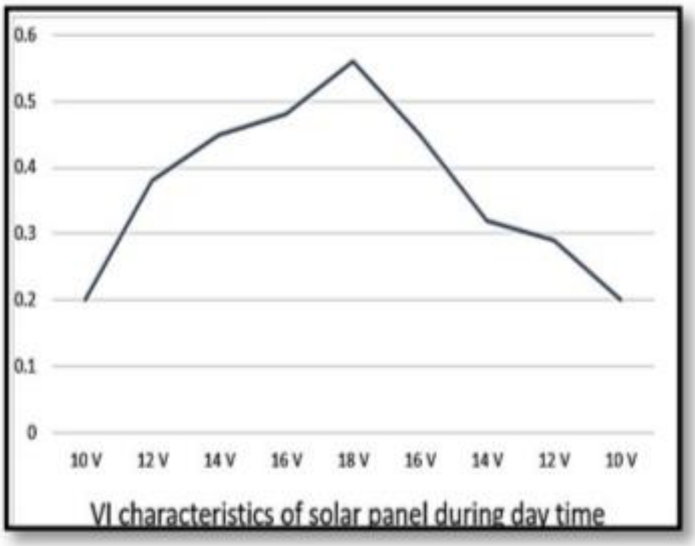

Fig:6 Characteristics of VI throughout the day

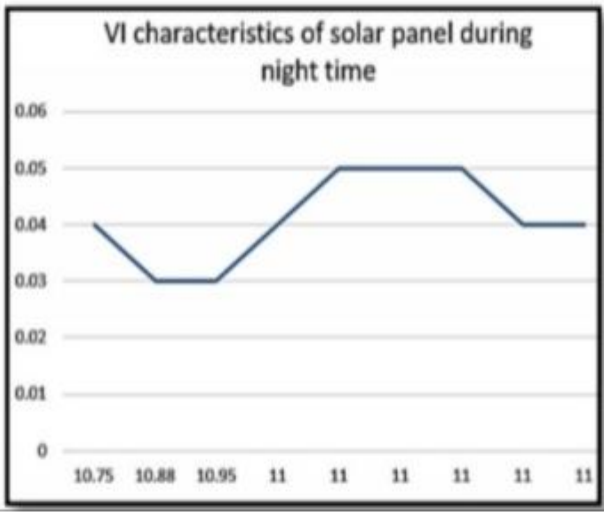

Fig:7 Characteristics of VI throughout the night

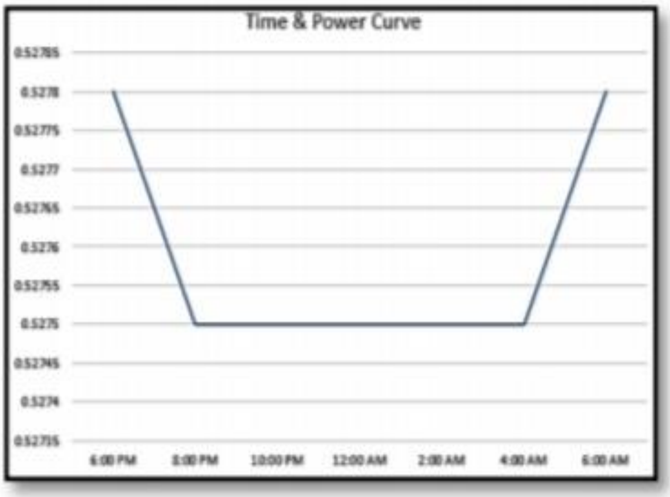

Fig:8 Time curve VS power

Energy savings calculation and cost analysis:

Table 2. calculation for energy saving:

POWER	= Voltage (V) * I (Current)
Pin	0.366 W
Pout	0.5275 W
Efficiency %	1.4412 %
Power Effective	0.1615 W
Energy at night	1.414 kWh
Energy at day	525.60 KWh
Energy Total	527 KWh
Annual saSaving in terms of Cost @Rs. 5 per unit	Rs. 2635
Return of investment	Within 27 Months

TABLE 3. Cost analysis:

COMPONENTS	QUANTITY	COST
PIC	1	1300
IOT(ESP8266)	1	170
Solar panel(12 watt 9 v)	1	1800
IRLED	30	75
LDR	1	20
Battery(12v)	1	1900
Voltage sensor	1	150
current sensor	1	175
4 relay	1	160
motor	1	800
frame	1	1500
TOTAL		**RS 8,050**

Applications of proposed technology

This idea can be employed in solar-powered street lights to switch on the street light for a longer period of time during the night due to the concurrent charging of the device. The duty proportion is changed when a battery is robbed. Daytime running lights are utilised in current bicycles to improve the battery's duty proportion since the charging season of the battery is lengthy but the usage season of the battery's power is short. A similar approach is used in the above-mentioned module: charging and discharging are done at equal intervals, guaranteeing that the battery's duty proportion is maintained and its life is extended.

Table 4: Comparision table:

EXISTENCE	**PROPOSED METHOD**
Power cannot be generated In rainy or night time.	Power can be generated both in night time and as well as in rainy days.
There is no protection layer for solar panel in rainy days.	To protect the solar panel from the rain water automatized IRLED doors were implemented.
If the charge of the battery is less in night time the power cannot be generated and the device will turn off.	If the the charge of the battery is less the IRLED door will be automatically close and the power will be generated using the IRLED lights.

8. Conclusion

Energy from the sun is the most potential source of energy for satisfying current and future energy demands. Solar energy can be challenging to use in a way that is both efficient and environmentally acceptable. This document talks over how to use solar panels to generate electricity even at night in great detail. It is an economical method of charging the battery while maintaining the load. When shadowed by trees or buildings, the suggested concept would allow the panel to be used both at night and during the day. For example, a solar street light's battery, must be able to power the load attached at night. A larger battery with a higher capacity is required to do this. As a result, the cost of initialization is extremely high. If the proposed design is used in a street light, the size of the battery required is drastically decreased, lowering the initial cost.

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