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REHABILITATED SOLAR POWER CONSUMED UTILITARIAN CHARGING DEVICE FOR MOBILE PHONE USING ABD

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Abstract - *A reformed model on Solar power consumed mobile phone charging by using ABD is proposed in this Paper. Here, solar energy is used for mobile phone charging. It is placed for mobile back cover. Solar energy is converted into electrical energy in order to charge mobile phones. This charging circuit is inbuilt with the mobile case. Whenever the mobile get exposed to sunlight the light energy is converted into electrical energy and get stored in the external battery further it will used for charging when we on the switch. Solar chargers are simple, portable, flexible, high power and never breakable one. Mobile phone has becomes unavoidable in our day to day life, so it can be used for everyone. This will be a socket free handy charging device. The block diagram, circuit diagram, hardware design are discussed in this paper.*

Keywords - *solar panel, battery, charge controller, solar energy, mobile phone.*

I. INTRODUCTION

This system introduces the mobile phone charging by using the solar panel, which is placed in floating mobile cover. It comprises of Solar panel, charge controller, mobile switching and lithium ion battery. Mobile switch control process is controlled by charging process which having three controls like internal charge control, solar power control, battery switching. Almost in our day to day life mobile phone is unavoidable one. So, we use the charger is in our mobile cover, it is very helpful to everyone to charging our phone in anytime at anywhere. Renewable energy resource is the arising technology which will replace the conventional energy resource. This process is nothing; we have to charge our phone through the solar panel charger. The sun light is reflected to the panel and the light energy is converted to the electrical energy by using charge controller, in which the charge is stored in the external battery. External battery does not directly give the power supply to internal battery. So we boost up the charge to internal battery in between the charger is connected, which controls the process are in battery switching. The biggest advantage is charge is stored in external battery every time.

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FIG. MOBILE CHARGER

Solar batteries are used to store solar energy (solar electricity) and discharge power as and when needed. This paper discussed the solar power consumed for mobile phone charging, which is placed in mobile back cover. Here, the system comprises the major components are battery, charge controller, mobile switch control and solar panel etc. Solar energy is converted into electrical energy and get stored in the external battery further it will used for charging. This will be socket free handy charging device and it is used for everyone.

II. FRAME WORK OF PROPOSED SYSTEM

A. ARCHITECTURE

In this Project, we propose a solar panel based mobile phone charger, which converts the solar energy into electrical energy for charging. Electrical energy obtained from the solar panel gets stored in external battery via charge controller. Charge controller is nothing but a device which controls current or voltage to get stored in external battery.

Whenever the mobile phone gets exposed to sunlight, the solar energy is converted to electrical energy and get stored in external battery. Hence charge remains in external battery all the time. Charge cannot transfer directly from external battery to internal battery (mobile phone's battery). So for the process of charging internal battery a charger is fixed in between the internal and external battery in order to boost up the charge.

And the entire charging process is controlled by mobile switch control which consist of internal charge control, solar power control, battery switching. It is inbuilt give mobile phone. Battery switching is a switch, by using this the charging time will get controlled by ON/OFF method.

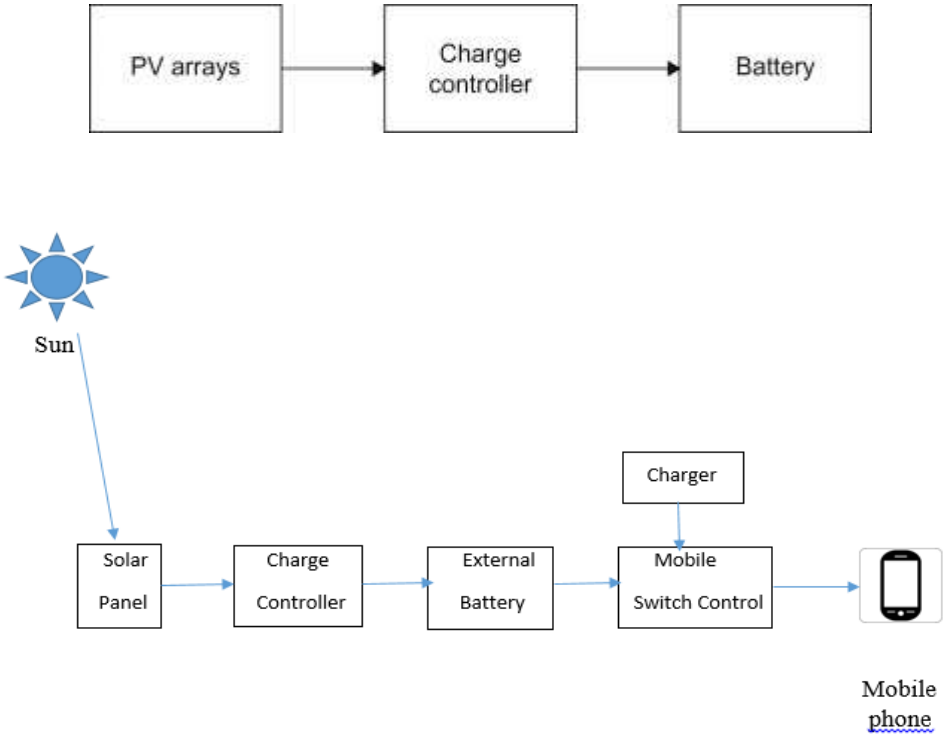

FIG. BLOCK DIAGRAM OF PROPOSED SYSTEM

B. FLOW CHART OF PROPOSED SYSTEM

We now describe the working for our mobile phone charging by using solar panel. The normal mobile charge capacity is +5v, 0.5 to 2.5 amp. In this system the panel, in which having the capacity is +5v, 100 to 150 m amp. It is never breakable and scratch loop and flexible. Solar panel converts the light energy into electrical energy from the sun. The energy is stored in the external battery by using the SMT charge controller. Here lithium ion battery is used, its having the capacity is 10,000 m amp. Entire charging process is controlled by mobile switch control which consist of internal charge control, solar power control, battery switching. It is inbuilt give mobile phone. Battery switching is a switch, by using this the charging time will get controlled by ON/OFF method.

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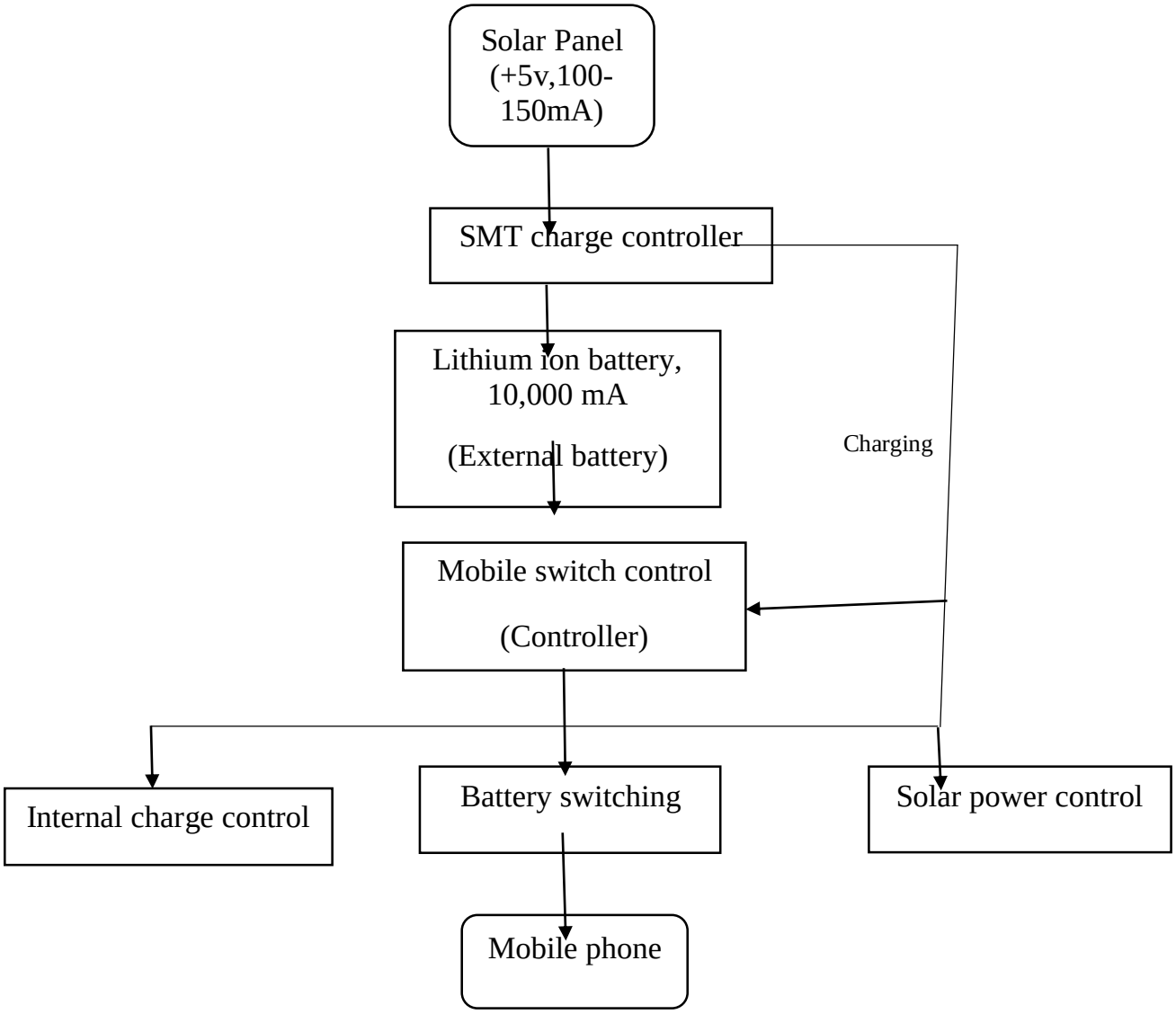

FIG. FLOW CHART OF PROPOSED SYSTEM

III. THEORITICAL BACKGROUND OF HARDWARE COMPONENTS

A.HARDWARE COMPONENTS

Hardware Requirements are:

- Solar panel
- SMT Charge controller
- Lithium ion battery
- Mobile switching

SOLAR PANEL

Solar panels work by absorbing sunlight with photovoltaic cells, generating direct current (DC) energy and then converting it to usable alternating current (AC) energy with the help of inverter technology. AC energy then flows through the home's electrical panel and is distributed accordingly.

FIG. SOLAR PANEL

Solar panels are fast becoming a very attractive renewable energy option, which could end up being incredibly beneficial to the environment. The process of converting sunlight to electrical energy is one that has improved dramatically over the last few decades, and is now more efficient than ever. The use of solar energy has been around for years in small devices such as calculators, but now many are talking about powering houses and businesses off of these panels.

Solar is one of the most promising renewable energy sources currently available, due to the fact that solar power is abundant. The rays that emanate from the sun can produce nearly 1,000 watts of energy for every square meter of the earth’s surface. By collecting that energy, we would never have to rely upon damaging fossil fuels again. A solar PV system uses sunlight to generate electricity which you can use to power your home or office that can reduce your carbon footprint and impact on the environment.

SMT CHARGE CONTROLLER

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk.

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FIG. CHARGE CONTROLLER

A charge controller or charge regulator is basically a voltage and/or current regulator to keep batteries from overcharging. It regulates the voltage and current coming from the solar panels going to the battery. Not always, but usually. Generally, there is no need for a charge controller with the small maintenance, or trickle charge panels, such as the 1 to 5-watt panels. A rough rule is that if the panel puts out about 2 watts or less for each 50 battery amp-hours, then you don't need one.

Charge controls come in all shapes, sizes, features, and price ranges. They range from the small 4.5 amp (Sun guard) control, up to the 60 to 80 amp MPPT programmable controllers with computer interface. Often, if currents over 60 amps are required, two or more 40 to 80 amp units are wired in parallel. The most common controls used for all battery based systems are in the 4 to 60 amp range, but some of the new MPPT controls such as the Outback Power Flex Max go up to 80 amps.

Charge controls come in 3 general types (with some overlap):

Simple 1 or 2 stage controls which rely on relays or shunt transistors to control the voltage in one or two steps. These essentially just short or disconnect the solar panel when a certain voltage is reached. For all practical purposes these are dinosaurs, but you still see a few on old systems - and some of the super cheap ones for sale on the internet. Their only real claim to fame is their reliability - they have so few components, there is not much to break.

3-stage and/or PWM such Morningstar, Xantrex, Blue Sky, Steca, and many others. These are pretty much the industry standard now, but you will occasionally still see some of the older shunt/relay types around, such as in the very cheap systems offered by discounters and mass marketers.

Maximum power point tracking (MPPT), such as those made by Midnite Solar, Xantrex, Outback Power, Morningstar and others. These are the ultimate in controllers, with prices to match - but with efficiencies in the 94% to 98% range, they can save considerable money on larger systems since they provide 10 to 30% more power to the battery. For more information, see our article on MPPT.

Most controllers come with some kind of indicator, either a simple LED, a series of LED's, or digital meters. Many newer ones, such as the Outback Power, Midnight Classic, Morningstar MPPT, and others now have built in computer interfaces for monitoring and control. The simplest usually have only a couple of small LED lamps, which show that you have power and that you are getting some kind of charge. Most of those with meters will show both

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voltage and the current coming from the panels and the battery voltage. Some also show how much current is being pulled from the LOAD terminals.

All of the charge controllers that we stock are 3 stage PWM types, and the MPPT units. (in reality, "4-stage" is somewhat advertising hype - it used to be called equalize, but someone decided that 4 stage was better than 3). And now we even see one that is advertised as "5-stage".

LITHIUM ION BATTERY

All lithium-ion batteries work in broadly the same way. When the battery is charging up, the lithium-cobalt oxide, positive electrode gives up some of its lithium ions, which move through the electrolyte to the negative, graphite electrode and remain there. The battery takes in and stores energy during this process. When the battery is discharging, the lithium ions move back across the electrolyte to the positive electrode, producing the energy that powers the battery. In both cases, electrons flow in the opposite direction to the ions around the outer circuit. Electrons do not flow through the electrolyte: it's effectively an insulating barrier, so far as electrons are concerned.

FIG. LITHIUM ION BATTERY

The movement of ions (through the electrolyte) and electrons (around the external circuit, in the opposite direction) are interconnected processes, and if either stops so does the other. If ions stop moving through the electrolyte because the battery completely discharges, electrons can't move through the outer circuit either—so you lose your power. Similarly, if you switch off whatever the battery is powering, the flow of electrons stops and so does the flow of ions. The battery essentially stops discharging at a high rate (but it does keep on discharging, at a very slow rate, even with the appliance disconnected).

Unlike simpler batteries, lithium-ion ones have built in electronic controllers that regulate how they charge and discharge. They prevent the overcharging and overheating that can cause lithium-ion batteries to explode in some circumstances.

MOBILE SWITCH CONTROL

Switch Control is an accessibility feature on iPhone and iPad that allows folks with limited mobility to have full use of their device with the help of ability switches and other adaptive devices. Switch Control is easiest to set up if you pair your adaptive device first in your iPhone or iPad's Bluetooth menu. Switch Access lets you interact with

your Android device using one or more switches instead of the touchscreen. Switch Access can be helpful for people with dexterity impairments that prevent them from interacting directly with the Android device.

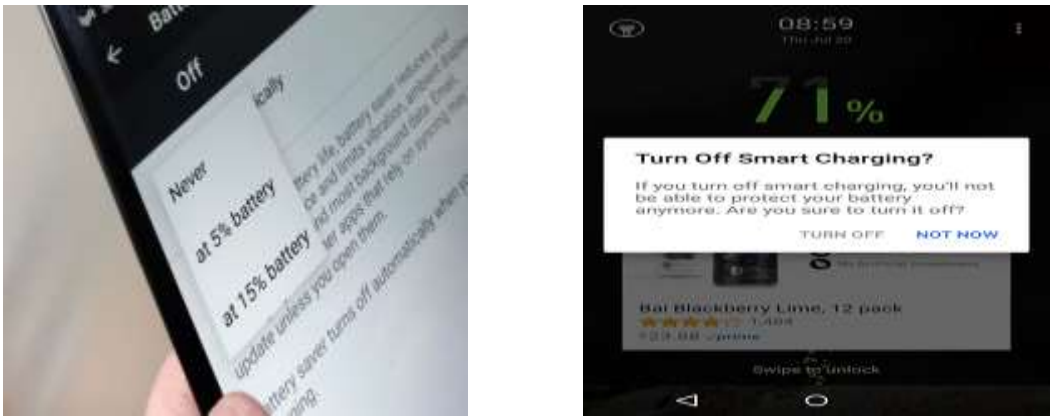

FIG. MOBILE SWITCH CONTROL

Mobile Phone Controlled Electrical Devices Switching. ... One phone will be placed in the control box itself which will be receive the signals from the user and another phone used to send the signal to the control box of the electrical devices are connected.

Mobile switch control is controlled by entire charging process which consists of internal charge control, solar power control and battery switching.

1. INTERNAL CHARGE CONTROL

An internal *charge controller, charge* regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. ... It may also prevent completely draining ("deep discharging") a battery, or perform *controlled* discharges, depending on the battery technology, to protect battery life.

2. SOLAR POWER CONTROL

A Solar charge controller or charge regulator is basically a voltage and/or current regulator to keep batteries from overcharging. It regulates the voltage and current coming from the solar panels going to the battery.

3. BATTERY SWITCHING

A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as inductors or capacitors to supply power when the switching device is in its non-conduction state.

B. CIRCUIT DESIGN

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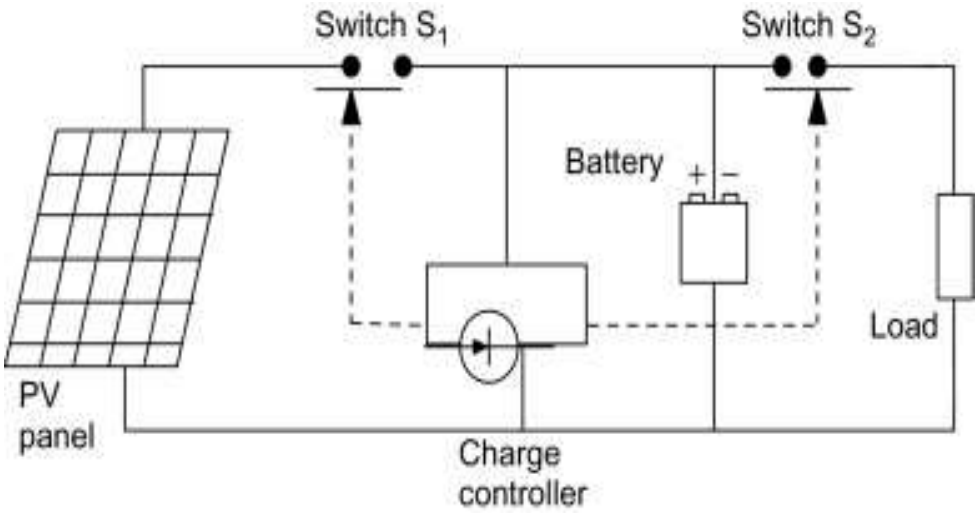

FIG.CIRCUIT DIAGRAM

OPERATION

The solar panel is a flexible panel with a rated power generation voltage of 5V. The weather condition is good and the sun is abundant, so that the solar panel can well absorb the sun's rays for work. The test time is at noon on the same day, when the sunlight is the strongest, and is vertical irradiation, there is no Angle deviation. To sum up, the above reasons can make the solar panel work under the condition of greater than the rated power, which is normal and can meet the requirements of power generation.

To measure the parameters of the solar controller input port, the input port has been connected to solar panels, solar controller output port connected to Lithium ion batteries, using a multimeter, according to the input voltage of 12.6 V, figure 1 power voltage of 20.5 V, it can be seen that changes in values, solar controller, Lithium ion batteries has access to achieve the effect of charging voltage matching, solar panels are for Lithium ion batteries recharged, through the multimeter to test the charging voltage of 12.6 V, solar controller display charging voltage of 12.7 V, the error of 0.1 V, in the range of allowable error, It achieves the effect of solar panels charging Lithium ion batteries. Here, solar energy is converted into electrical energy in order to charge mobile phones. This charging circuit is inbuilt with the mobile case. Whenever the mobile get exposed to sunlight the light energy is converted into electrical energy and get stored in the external battery further it will used for charging when we on the switch. Solar chargers are simple, portable, flexible, high power and never breakable one. Mobile phone has becomes unavoidable in our day to day life, so it can be used for everyone. This will be a socket free handy charging device. Renewable energy resource is the arising technology which will replace the conventional energy resource.

C. FEATURES OF HARDWARE COMPONENTS

- Flexible solar panel
- Scratch loop
- Never breakable
- High power efficient
- Very small size battery
- Fast charging
- Long life

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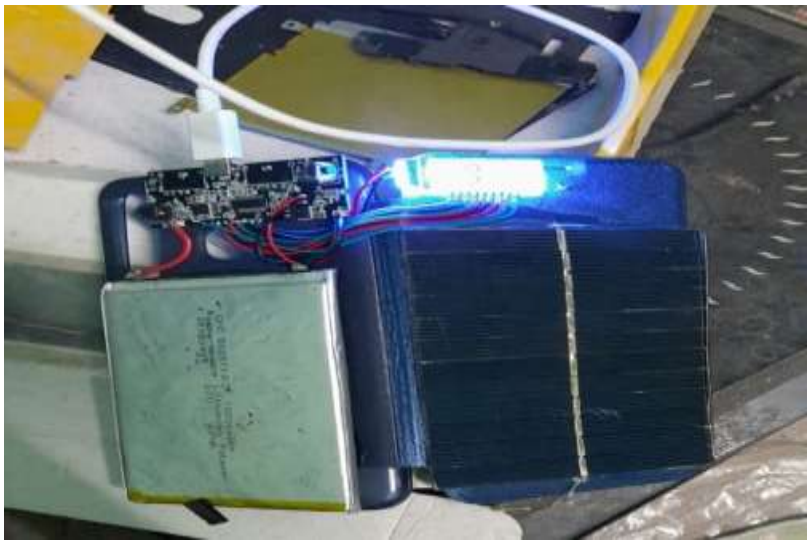
- Sleek design
- Portable
- Low power consumption
- SMT Technology is used

IV. RESULT



V. CONCLUSION

We have presented the main objective of the project was charging the mobile phone by using the solar panel, which is placed in mobile back cover or floating cover. The charging circuit is inbuilt with the mobile case. Whenever the mobile get exposed to sun light the light energy is converted into electrical energy and get stored in the external battery further it will used for charging when we on the switch. Hence charge remains in external battery all the time. To encourage and implement renewable energy resource in day to day usage. To reduce time consumption in the name of charging. Reduction of bursting mobile phones while get use when charging. This will be a socket free handy charging device. So it is very useful to charge our mobile phone.

REFERENCES

[1] S. Sheik Mohammed, and D. Devaraj," Simulation and analysis of stand-alone photovoltaic system with boost converter using MATLAB/Simulink, " *IEEE Conference,* 2014.

[2] Christian Schuss, Bernd Eichbergert, and Timo Rahkonen, " Design specifications and guidelines for efficient solar chargers of mobile phones ," *IEEE Transaction,* 2014.

[3] Christian Schuss, and Timo Rahkonen," Solar energy harvesting strategies for portable devices such as mobile phones,"*14th Conference of FRUCT Association,* 2014.

[4] C. Schuss, and T. Rahkonen, "Use of mobile phones as microcontrollers for control applications such as maximum power point tracking," *Proceedings of the IEEE Mediterranean Electrotechnical Conference (MELECON)*, 2012

[5] C. Schuss, and T. Rahkonen, "Photovoltaic (PV) energy as recharge source for portable devices such as mobile phones," *Proceedings of thenih Conference of FRUCT Association*, 2012.

[6] C. Li, W. 1ia, Q. Tao, and M. Sun, "Solar cell phone charger performance in indoor environment," *IEEE Annual Northeast Bioengineering Conference (NEBEC)*, 2011.

[7] S. Sheik Mohammed, K. Ramasamy, and T. Shanmuganantham, "Wireless power transmission – A next generation power transmission system," *International Journal of Computer Applications*, Vol. 1, No.13, 2010.

[8] Wyche S P, Murphy L L. "Powering the cellphone revolution:findings from mobile phone charging trials in off-grid Kenya" Sigchi Conference on Human Factors in Computing Systems. 2013.

[9] Hill C A, Such M C, Chen D, et al. "Battery Energy Storage for Enabling Integration of Distributed Solar Power Generation." IEEE Transactions on Smart Grid, vol. 3(2), pp. 850-857, 2012.

[10] Sun Y, Wu Q, Shi G. "Graphene based new energy materials". Energy & Environmental Science, vol. 4(4), pp. 1113-1132, 2011.