

Practical Kit for Promoting Solar Energy at Educational Centers

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Abstract

Promoting the use of solar energy is equally or more important as research and development. Portable Kit is assembled to show the basics of solar energy, working of solar oven for heating of meal as well as DC/AC electricity generation for demonstration and performing some experiments at schools and colleges.

Keywords: Solar Energy; Energy Saving; Teaching of Warming Meal and Solar Electricity; Promoting Solar Energy

Introduction

Research and publication at the universities is necessary for knowledge, academic purposes and for some additional salary. But it is very important to promote the knowledge so that more persons can use for the energy/money saving for them and also maintain our planet clean. As far electricity is concerned, in Costa Rica more than 99% of electricity is generated by renewable sources, like hydro, geothermal, wind and partially by Sun. But for many heating applications like water heating, cooking and heating meals, solar energy can be used directly to replace the use of electricity. And some fossil fuels, like LPG gas and diesel etc.

I started research on utilization of Solar energy in 1976 at Indian Institute of Technology, Delhi, India and continued at Department of Physics of Universidad Nacional, Heredia in Costa Rica, since July 1978 until retired in Jan. 2013. During this this period, in addition to publishing about 140 research articles in technical journals and national and international conferences and with my collaborators I also did lot of promotional activities like SUN DAY, May 3, Environmental Day June 5, organized national, regional and world conferences [1-3] and gave popular, semi technical and technical lectures at schools, colleges, universities and cultural

centers in Costa Rica and another 42 countries [4]. Even after retirement in 2013, I continue some of these activities from my house and small laboratory, just as an addiction to keep busy and share the knowledge and experience, with future promotor.

When you ask someone why you do not use particular solar device - the answers may be variables, I did not know of this, I have never heard, I have not seen, I have seen only in photo, but not in working mode, including its expensive initially as compared to conventional device etc.

Promotion means explain and show the working of device in LIVE mode rather than VIRTUAL mode. Although promotor can explain concept of payback period, however firstly he has to convince the user. Author has done this for last 44 years and still continuing.

This promotion can be done for different audience, for professionals, for general public and for students at Schools and Colleges etc.

Promotional activities for professionals, public and kids

For professionals and public. At university during 35 years we organized many activities like SUN Day, Environment Day where

we invite the public for two full days to show various thermal devices, like solar water heaters, solar cookers/ovens, solar stills and solar dryers, bio digestors, and solar electric panels and solar house, all in the working mode. Also we organized National, Regional seminars (1-7 days), where participants, in addition to theoretical lectures, could see the working of solar devices in our backyard (Photo 1). This also gave some additional advantages. We were charging participants some registration fee. At the end of the activities, we could save some money for our research activities. After retirement in 2013, I continued promotional activities, like organizing 8-16 hours practical workshops [5-7] for general public but at my house (Photo 2). Here I could show the working of some solar devices as at university.

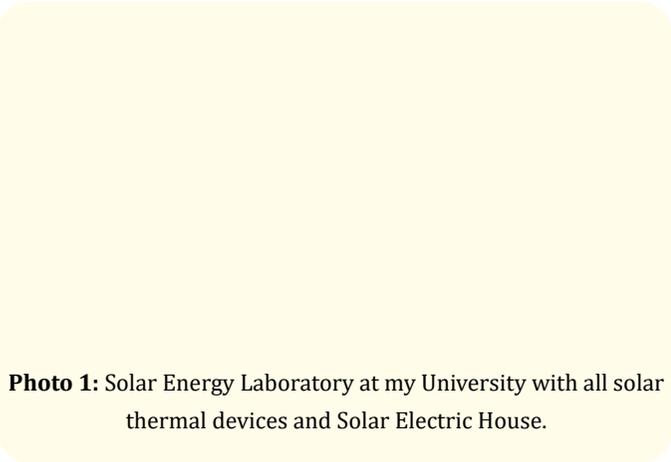


Photo 1: Solar Energy Laboratory at my University with all solar thermal devices and Solar Electric House.

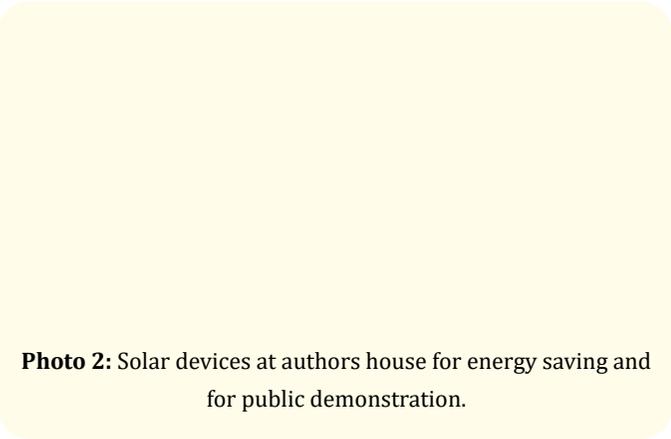


Photo 2: Solar devices at authors house for energy saving and for public demonstration.

Kits for schools and college kids

In Costa Rica, military was abolished in 1949 and more funding is provided for education. There are about 1.2 million students at

primary and secondary levels. Just for information, population of Costa Rica is about 5.5 million. Kids are the Pillar of the society and have curiosity (Photo 3) and need answer.

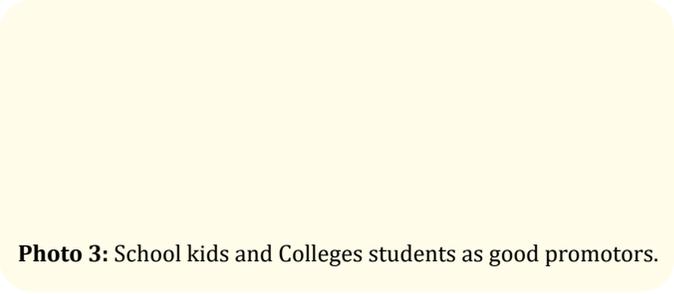


Photo 3: School kids and Colleges students as good promoters.

Also, they have to do small projects for their graduation. Many times, I am invited to give lectures at schools and colleges and other cultural centers (Photo 4). Here I could show the solar devices only with power point, but no working devices like at university and at my house as explained already.

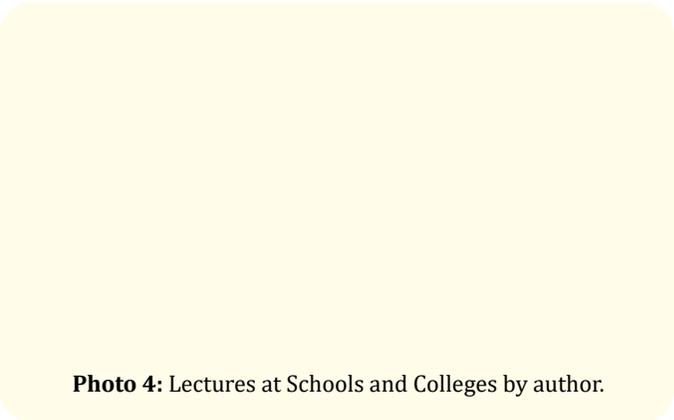


Photo 4: Lectures at Schools and Colleges by author.

In order to show some solar simple devices in working mode. Firstly I thought of taking small solar thermal oven made of wood (Photo 5) and photovoltaic electric kit (Photo 6) for some simple demonstration.

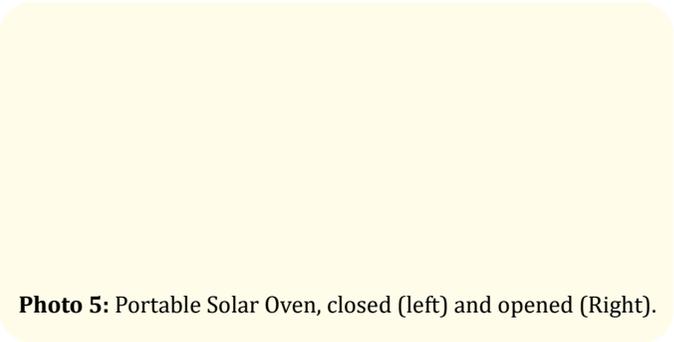


Photo 5: Portable Solar Oven, closed (left) and opened (Right).

Although we do not plan to show the real solar cooking, however one can show the increase of oven temperature, just keeping oven in Sun for 15-30 min and compare with outside temperature.

I was also carrying one photovoltaic system assembled in wooden box (Photo 6). Here the basic components are solar panel, controller, battery and an inverter. This box can show both generation and working of DC and AC devices. In this kit students can see the functioning of light bulbs and also measure the voltage generated for different climate or different solar radiation.

Photo 6: Portable Solar Photovoltaic system for DC and AC electricity generation.

Portable single kit/for educational centers

Instead of carrying two boxes or kits, then I thought of making single box /kit for both devices mentioned already. It can be carried even in Bus (Photo 7). Once opened one can see both devices. inside the box. there are many components as explained already.

Photo 7: Single portable Box/Kit for showing Solar Oven and Photovoltaic System, in closed (left) and open mode (right).

For Solar Oven (Photo 8): One iron metallic plate, painted black on the top, some heat insulation on four sides and at the bottom, one transparent glass 3 mm thick and a mirror as reflector and a small

pot for heating meal. Normally I carry also one oven thermometer and portable solar radiation meter to show the temperature inside the oven (box) and outside the box and explain the concept of greenhouse and global warming.

Photo 8: Kit in the mode of Solar Oven.

For Electricity generation. If we remove the metallic plate and glass, the box is turned into photovoltaic device. It contains, one solar panel 2Wp/12V, one battery 12V/7Ah, one charge regulator and one inverter (Photo 9a). In this way, one can show many experiments with both as DC as well AC device (Photo 9b). I also carry one simple solar radiation meter, and small multimeter so that students can measure the voltage generated by solar panel with different climate (solar radiation) and can even measure the efficiency of electric device. One can carry also 200W/110V incandescent bulb to show some working in case of rain or very cloudy period.

Photo 9a: Kit in the mode of solar electricity.

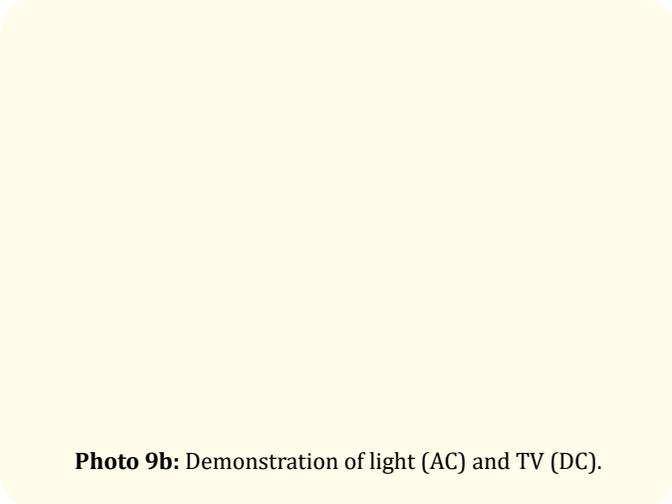


Photo 9b: Demonstration of light (AC) and TV (DC).

Conclusions

With promotional activities like seminars, workshops, interested persons get practical knowledge, for their uses, get more contacts among participants for their later communications. For these activities we charge some fee. This has helped us a lot for some of our research activities. Also this small single kit for the schools/colleges, compliment theoretical knowledge with practical demonstration etc. About 35-40 schools and colleges already got about 90-100 solar ovens to heat their lunch without any government support. This reduces electricity saving for college. As a promotor I also earn some certificates (Photo 10) and recognitions and more than all, personal satisfaction and sweet dreams at night.

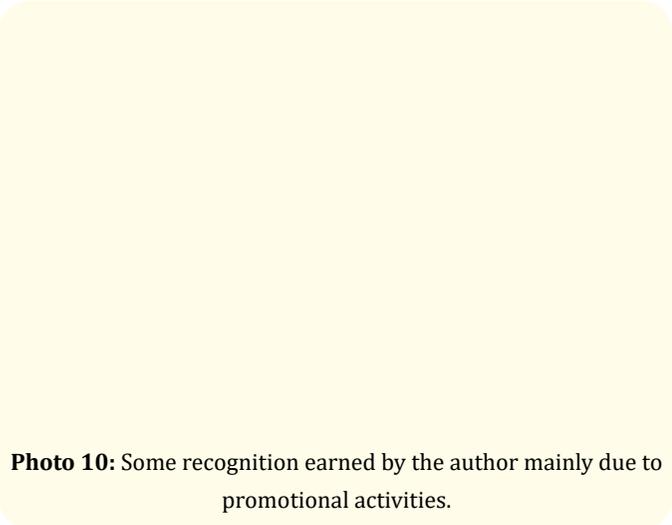


Photo 10: Some recognition earned by the author mainly due to promotional activities.

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