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Madhurawada, Visakhapatnam  
(Affiliated to JNTUK, Approved by AICTE, New Delhi)

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**The Solar Tree for Electrical Vehicle Charging has  
been developed by**

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### ***Abstract:***

Solar Tree installed in the country either support grid on used for LED street lightning applications. The solar tree installed in the campus supports EV charging along with mobile and laptop charging. This is the first of its kind in an educational institution in and around Visakhapatnam. The solar tree is interfaced with the grid to support the EV charging during night times. A 250W solar tree with 12V battery has been installed in the campus.

### ***Design Procedure:***

The various steps followed for developing the solar tree are as follows

**Step1:** Selection of the rating of panels, battery and inverter.

**Step2:** Selection of the shape of the tree.

**Step3:** Structuring the layout.

**Step4:** Optimal selection of the angle of tilt and direction of placement.

**Step5:** Connections and installation of the solar tree.

### ***Step:1***

As this is the first project of its kind in the campus, a low rating has been selected. Initially the tree rating has been fixed as 250W with 5 branches (each of 50W). A proper selection of battery is equally important for supporting the laptop/mobile charging round the clock. A 12V LFP battery has been selected as the panels available are of 18V (peak). In order to charge/discharge the battery upto a longer time, a higher Ah rating of battery is required. Since the rating of the peak power of solar panel is 250W, the ampere ratings of battery should be  $250/12=20.83\text{A}$  at max. For safer operation a 24Ah battery has been selected with a BMS of 30A.

As the basic aim of the project is charging E-bike, and each E-bike has different voltage ratings as well as individual chargers' conversion to AC is mandatory. Also, it is required to change the battery with solar power in this regard a solar inverter has been employed in the system. The rating of the inverter should match the power rating of the panel and battery, hence at least 500VA inverter is essential. However, to allow further increase in the capacity of solar panels, in the near future an 850VA inverter has been accommodated in the system.

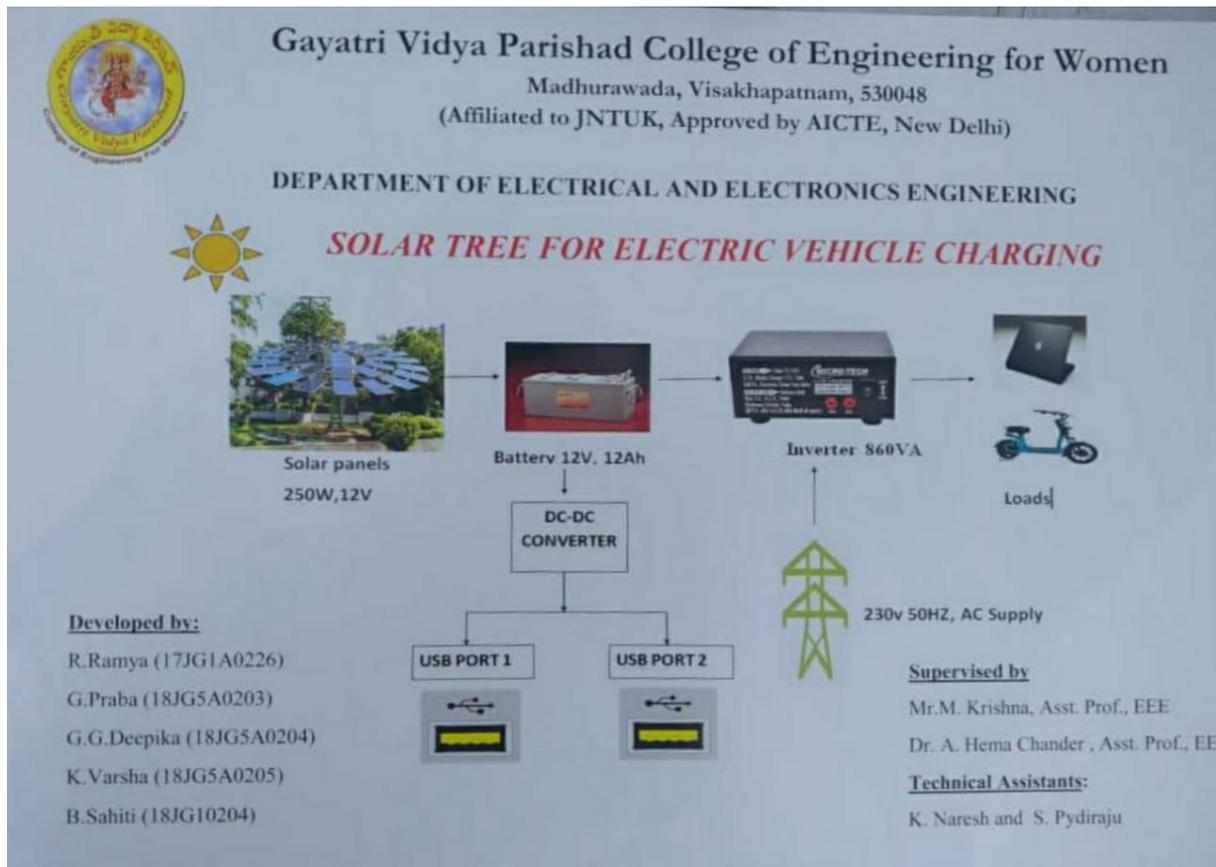


Fig.1. Block diagram of EV charging station using solar tree

**Step2:**

Selection of shape of the tree is crucial. It is not worthy that the branches of the tree should not create partial shading on the other panels. In this regard various shapes have been investigated. The major advantages of circular shape include:

- Does not have partial shading on other panels
- Easy to extend in future.

In this regard, the circular shape has been employed.

**Step:3**

The structuring layout and specification of panel and tree as follows:

Dimensions of solar panel: 55cm\*57cm

Pole height:10 feet

Branches length(panel rods):4 feet

Round plate: 13cm,8mm(thickness)

#### ***Step4:***

Optimal selection of tilt angle and direction of placement:

In order to realize the maximum power throughout the year, it is a general practice to orient the panel from North-South direction. The tilt angle is the latitude angle of the location where installed tilt angle of the panel is 18 degrees.

#### ***Step5:***

Construction and process of installation:

The solar tree consists of some important parts in its design. They are as follows:

- Solar panels
- Long pole
- Battery
- Stems for connecting the panels
- Inverter

First the panels are arranged in such a way that the angle between each panel is 72 degrees. Then these panels are welded by connecting the rods (stems) of length 4 feet. This entire structure is then welded to the circular plate of 13 cm diameter. Now this is connected to the pole of 10 feet with the help of angular plates and bolts. With the help of angular plate, we can rotate the entire structure of branches of tree when the changes occur in solar radiation. The panels are placed on the basis of latitude angle of Visakhapatnam i.e., 18 degrees. And it is placed in the direction of north-south.

All the panels are connected together in parallel to obtain constant voltage. Then it is connected to inverter terminals along with battery.

#### **Working:**

The energy from the solar panels is stored in battery. Battery is charged during the day time and the output from battery is given to inverter. Then the inverter converts DC to AC. From the output terminals of inverter, we can charge the loads. We are also connected AC grid to the system for uninterrupted supply during cloudy days and no sunlight is there.



Fig.2. Developed solar tree for EV charging

***Conclusion:***

The main aim of this project is uplifting the public opinion on Renewable Energy sources and promoting of electric vehicles. The major problem faced by user when using EVs is charge requirement. By constructing this type of charging stations using solar tree can increase the usage of electric vehicles by providing charge when it requires. To fulfil the requirement of charge for EVs where people need by saving of land ,this project is very successful one.





## నూతన ఆవిష్కరణలు చేపట్టాలి: 'గాయత్రి' అధ్యక్షుడు పీఎస్ రావు

కొవ్వూడి, జనవరి 26: విద్యార్థులు సాంకేతిక రంగంలో పట్టు సాధించి నూతన ఆవిష్కరణలను చేపట్టాలని గాయత్రి విద్యాపరిషత్ అధ్యక్షుడు పీఎస్ రావు పేర్కొన్నారు. గాయత్రి విద్యాపరిషత్ మహిళా ఇంజనీరింగ్ కళాశాలలో మంగళవారం నిర్వహించిన గణతంత్ర దినోత్సవానికి ఆయన ముఖ్యఅతిథిగా హాజరయ్యారు. ఈ సందర్భంగా మహిళా ఇంజనీరింగ్ కళాశాల ఎలక్ట్రికల్ విభాగం విద్యార్థినులు రూపొందించిన సౌరశక్తితో పనిచేసే ఎలక్ట్రికల్ వెహికల్ ఛార్జింగ్ స్టేషన్‌ను ఆయన ప్రారంభించి మాట్లాడారు. ప్రస్తుతం వాహన కాలుష్యాన్ని తగ్గించడానికి ఎలక్ట్రికల్ వాహనాలు వినియోగంలోకి వస్తున్నాయని, తమ విద్యార్థినులు అతి తక్కువ ఖర్చుతో రూపొందించిన ఈ ఎలక్ట్రికల్ వాహనాల ఛార్జింగ్ స్టేషన్‌ను రహదారుల వద్ద ఏర్పాటుచేస్తే ఆయా వాహనదారులకు ఉపయోగంగా ఉంటుందన్నారు. దీనిని తయారుచేసిన విద్యార్థినులు రమాదేవి, ప్రభ, దీపిక, వర్ష, సాహితీలతో పాటు వారికి మెంటర్లుగా వ్యవహ



విద్యార్థినులు రూపొందించిన ఎలక్ట్రికల్ ఛార్జింగ్ స్టేషన్ వద్ద పీఎస్ రావు, తదితరులు

రించిన ఆచార్య కృష్ణ, అసిస్టెంట్ ప్రొఫెసర్ ఎ.హేమచందర్‌లను అభినందించారు. కార్యక్రమంలో కళాశాల కార్యదర్శి పులగుర్ల సోమరాజు, గాయత్రి విద్యాపరిషత్ మాజీ అధ్యక్షుడు ప్రసాద్, తదితరులు పాల్గొన్నారు. విద్యార్థినులు ఏర్పాటు చేసిన సాఫ్ట్‌వేర్, హార్డ్‌వేర్ ఎగ్జిబిషన్ అందరినీ ఆకట్టుకుంది.

ఆంధ్రజ్యోతి

Wed, 27 January 2021

<https://epaper.andhraajyothy.com/c/58006742>

