A Major-Project report on

"An Implementation of Solar PV Array Based Multifunctional EV Charger"

Submitted to

Jawaharlal Nehru Technological University, Hyderabad

In partial fulfilment of the academic requirements for

the award of Degree of

BACHELOR OF TECHNOLOGY

In

ELECTRICAL &ELECTRONICS ENGINEERING

By

Y.POOJA	206Y5A0227
P.SAMYUKTHA	196Y1A0212
G.NIKHITHA	196Y1A0204
B.SANDHYA	206Y5A0203

Under the esteemed guidance of

Mrs. P.SUCHARITHA M.Tech

Assistant Professor

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SUMATHI REDDY
INSTITUTE OF TECHNOLOGY FOR WOMEN
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2022-23

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PRINCIPAL
Sumathi Reddy Institute of Technology for Women
Ananthasagar (V), Hasanparthy (M)
WARANGAL - 506 371 (T.S.)

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CERTIFICATE

This is to certify that the major project entitled **"An Implementation of Solar PV Array based Multifunctional EV Charger"** submitted to JNTUH carried out by the following students of IV-B.Tech in the partial fulfillment for the award of the B.Tech Degree in **Electrical & Electronics Engineering** during the academic year 2022-23.

Y.POOJA	206Y5A0227
P.SAMYUKTHA	196Y1A0212
G.NIKHITHA	196Y1A0204
B.SANDHYA	206Y5A0203

Guide
Mrs. P.Sucharitha

Head of the Dept
Dr. K. Mahender Sharma

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Ananthasagar (V), Hasanparthy (M)
WARANGAL- 506 371(T.S.)

ABSTRACT

In this project an implementation of solar photovoltaic (PV) array powered grid connected, residential electric vehicle (EV) charger is presented, which caters the need of an EV, household loads and the grid. The charger is enabled to operate autonomously using a PV array for providing an uninterruptible charging and power to household loads. However, in the absence of the PV array or insufficient PV array generation, the grid connected mode of operation is presented. Moreover, the charger is supported with the synchronization and seamless mode switching control, so that the charger automatically connects/disconnects from the grid without disturbing the EV charging and household supply. The charger is also enabled with the vehicle-to-grid (V2G) active/reactive power support to the grid and vehicle-to-home (V2H) power transfer for supporting the local loads in an islanded condition. The charger is also controlled to operate as an active power filter for achieving the unity power factor (UPF) operation and total harmonic distortion (THD) of the grid current within 5%. Moreover, for achieving energy management, a dc-link voltage regulation based energy management strategy is used and a sliding mode control (SMC) is used for regulating the dc-link voltage. For satisfactory operation under distorted voltage condition, a second-order generalized integrator frequency locked loop with dc offset rejection (SOGI-FLL-DR), is used to generate the sinusoidal reference grid current. The charger is designed for a single-phase 230V, 50Hz grid and it is experimentally validated in the laboratory.

S.R.I.T. FOR WOMEN * WARANGAL *

Principal
Sumathi Reddy Institute of Technology for Women
Ananthasagar (V), Hasanparthy (M)
WARANGAL - 506 371 (TS)