# MICROGRIDS IN VARIABLE LOADING CONDITIONS USINGRFID TECHNOLOGY

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**Abstract**

The Microgrids represent a pivotal innovation in modern energy systems, enabling localized power generation, distribution, and consumption with enhanced reliability and sustainability. Their ability to operate in both grid-connected and islanded modes makes them particularly valuable in integrating renewable energy sources. However, the dynamic nature of variable loading conditions driven by fluctuations in energy demand, the intermittent nature of renewable energy sources such as solar and wind, and uncertainties in grid connectivity—poses significant challenges to their operation and stability. This paper presents an in-depth exploration of microgrid performance under variable loading conditions, addressing key challenges such as maintaining power quality, ensuring voltage and frequency stability, and optimizing energy flow between distributed energy resources (DERs) and loads. The study highlights the importance of accurate load forecasting, advanced energy. By addressing the complexities of variable loading conditions, this paper contributes to the development of robust frameworks for microgrid optimization and long-term reliability.

**Keywords:** Hardware Development Kit**,** Electric Vehicles,RFID Reader,Ardunio, Solar Pannel Inverter.

## I. INTRODUCTION

The hybrid electric vehicles play a major role in the present market and it obtains their energy from the combustion engine. However, in order to alleviate the utilization of gasoline, the plug-in electric vehicles (PHEVs) entered into the market and it takes the energy from the grid for driving. To increase the life of storage system, cost reduction, and the flexible grid connectivity, the PHEVs are still under research. Renewable based charging station can be of two types one is grid connected system and the other is standalone system. In case of stand- alone system, an additional storage system is very essential for providing continuous power supply. A bidirectional converter and has to be designed for the BESS which stores the excess energy produced from renewables in the day time and to discharge during the night time to charge EVs.

Current controller is required to control the duty ratio of the switch in the bidirectional converter circuit. Battery current can be controlled using Proportional-Integral Derivative (PID) controller to avoid overheating. Charge and discharge behavior of a battery is

nonlinear and a thorough knowledge of its characteristics is required for modelling of battery as they have direct influence on EV performance. When SOC of battery is less than 20% charging happens at high currents and voltage gradually increases.

## II. LITERATURESURVEY

This methodology for the demand for electric vehicles increases, the need for efficient and sustainable charging solutions becomes more pressing.However, the current infrastructure for EV charging is often insufficient, and the use of fossil fuels to generate electricity. For charging raises concerns about environmental sustainability. This Project addresses these issues by introducing the concept of smart hybrid EV charging.

This aims to optimize the use of different sources of power for EV charging, and reduce the reliance on fossil fuels.designing a RBS has been described. Three were built and tested, first using a test bed and then installed on an electric hybrid city bus. For the serial, a key problem of how to adjust the friction braking force has been solved. Some factors have been taken into account in increasing the energy regeneration efficiency.

## III. PROBLEMFORMULATION

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## IV. OBJECTIVES OF WORK

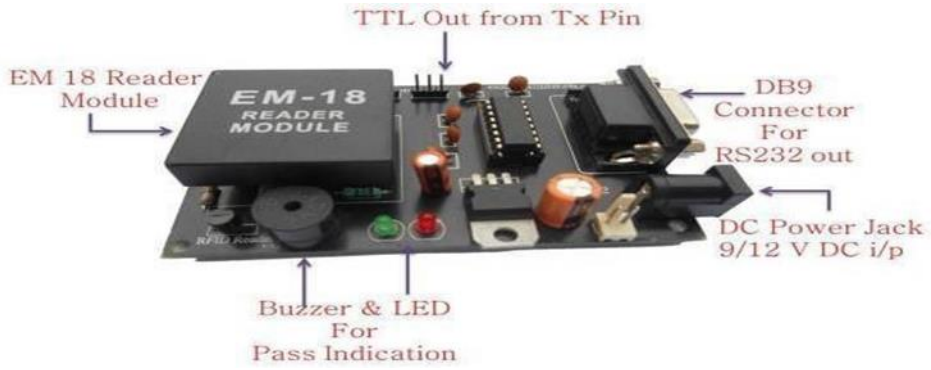
To explain the concept of smart hybrid EV charging and its importance for the future of transportation and energy. To provide an overview of on-grid power, green power, and wireless charging with RFID technology.To discuss the advantages and challenges of using each of these components for EV charging.

The power electronic converters play an important role in EVs to deliver the required amount of power during acceleration and to store, utilise, and gain energy during regenerative braking.

## V. HARDWARE EQUIPMENT

### RFID READER

The µRFID reader is a low cost, low power consumption, small size & easy to use device ideal to develop an RFID system. Once powered, it can detect any RFID card within range and with the frequency same as that of its working frequency (125 kHz). It can interact with a microcontroller in in any one of the two supported protocols namely TTL Serial & Wiegand 26 as per the system design. µRFID




reader also has a detection pin(BUZ) that could be used to simply detect a valid RFID card. Its form factor and output data formats are 100% compatible with EM- 18 Reader Module.EM-18 RFID reader module uses a RFID reader that can read 125 KHz tags. So, it can be called as a low frequency RFID reader. It gives out a serial output and has a range of about 8-12 cm. There is a built-in antenna and it can be connected to the PC with the help of RS232.

**Fig.1 RFID MODULE**

From this Fig.1 board is based on the EM-18 RFID Module. Using the board with microcontrollers to read a card's data is very simple and requires just a serial connection. The board has a 5V voltage regulator so it can be powered by 9~15V DC adaptor. Module can also be powered through header wires (+5V & GND) from other interfacing board. The board has power indication LED (Labeledredincolor) and to indicate the detection of Card/Tag, it has a LED (Labeled green in color) and Buzzer. Selection jumper is used to switch between two output formats: Serial O/P .

TTL/CMOS Pin (Microcontroller Compatible) and RS232 O/P from DB9 Female Connector. (Note:- Data is available at both TTL/CMOS and DB9 simultaneously.) Weigand26 O/P from ONLY DATA2 (It is DATA0 pin of EM-18) & DATA1 (It is DATA1 pin of EM-18) Pins. (Note:- This is a differentmode which uses different protocol, so if selected data can’t be read using SERIAL Protocols, Like on UART or HyperTerminal.)

## VI. FUNCTIONALDESCRIPTIONS

**MCU:**

ESP8266EXisembeddedwithTensilicaL10632-bitmicrocontroller(MCU),whichfeatures extralowpowerconsumptionand16-bitRSIC.TheCPUclockspeed is80MHz. Itcanalsoreacha maximumvalueof160MHz.ESP8266EXisoftenintegratedwithexternalsensorsandotherspecific devices through its GPIOs; codes for such applications are provided in examples in the SDK.

**MEMORYORGANIZATION**

Memory organization refers to the way acomputer system organizes and manages its memory resources, ensuring efficient data storage, retrieval, and access. It encompasses both the physical structure of memory and the methods used to allocate and access memory

locations.

**INTERNALS RAMANDROM**

ESP8266EXWi-FiSOCisembeddedwithmemorycontroller,includingSRAMandROM. MCU can visit the memory units through I Bus, d Bus, and AHB interfaces. All memory units can be visited upon request, while a memory arbiter will decide the running sequence according to the time when these requests are received by the processor. RAM size < 36kB, that is to say, when ESP8266EXisworkingunderthestationmodeanddisconnectedtotherouter,programmablespace accessible to user in heap and data section is around 36kB.)ThereisnoprogrammableROMintheSOC,therefore,userprogrammustbestoredinan external SPI flash.

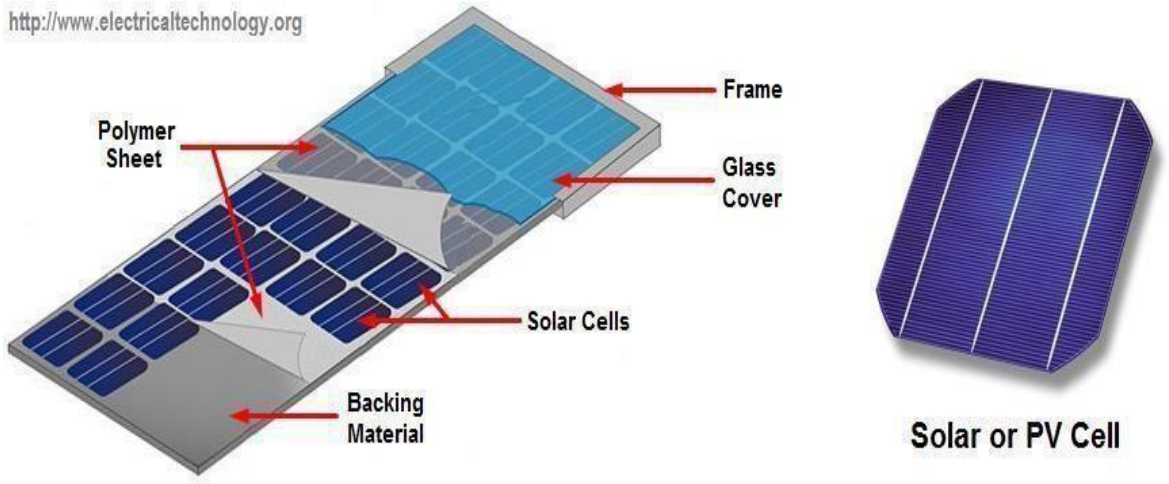
**EXTERNALSPI FLASH**

This module is mounted with an 4 MB external SPI flash to store user programs. If larger definable storagespace is required, aSPIflash with largermemory size is preferred. Theoretically speaking, up to 16 MB memory capacity can be supported.

## VII.SOLAR PANEL

**SOLARPHOTOVOLTAICCELL**

Electricity is produced in solar cells which, as noted, consist of more layers of semi conductive material. When the sun's rays shine down upon the solar cells, the electromotive force between these layers is being created, which causes the flow of electricity. The higher the solar radiation intensity,the greater the flow of electricity.The most common material for the production of solar cells is silicon. Silicon is obtained from sand and is one of the most common elements in the earth's crust, so there islimit to the availability of raw




materials

**Fig.2 S ..nufacturing**

**Technologies are**

- Mono Crystalline,
- Poly Crystalline,
- Bar-CrystallineSilicon,
- Thinfilm Technology.

## VIII. SOLAR INVERTER

**SOLAR INVERTERS**

A solar inverter can be defined as an electrical converter that changes the uneven DC (direct current) output of a solar panel into an AC (alternating current). This current can be used for different applicationslike in a viable electrical grid otherwise off-grid electrical network. In a PV system, it isa dangerous BOS (balance of system) component that allows the utilization of normal AC powered apparatus. These inverters have some functions with PV arrays like tracking of utmost PowerPoint & protection of anti-islanding. If we are using a solar system for a home, the selection & installation oftheinverteris important. So, an inverteris an essential devicein the solarpowersystem.

**Fig.3 Solar Inverters**

## IX. ARDUINOIDE

**ARDUINO**

Arduinoisanopen-sourceelectronicsplatformbasedoneasy-to-usehardwareandsoftware. Arduinoboard areableto read inputs -light on asensor,afinger onabutton, oraTwittermessage and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the ArduinoSoftware (IDE), based on Processing.

**ARDUINOBOARD DESCRIPTION**

WewilllearnaboutthedifferentcomponentsontheArduinoboard.WewillstudytheArduino UNO board because it is the most popular board in the Arduino board family.In addition, it is the best board to get started with electronics and coding. Some boards look a bit different from the one given below, but most Arduino's have majority of these components in common.

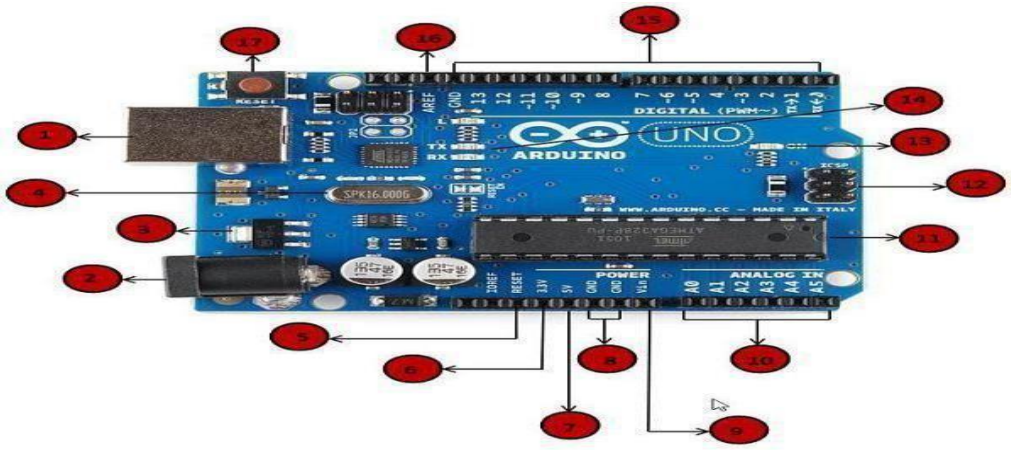



**Fig.4 Arduino Board**

## X.RESULTS

Inourproject workweareutilizingbothsunorientedandwindenergyforbatteriescharging once the batteries are charged completely, thenthe power is given to Inverter module to change overitintoAC.ThechangedoveracpowerisgiventoelectricvehiclesintheformoflighttoRFID Verification.ForSecuritypurposewearegivingRFIDLabelstothechargingstationtochargetheir vehicles in appropriate strategy. In this venture giving 3-Sorts of charging strategies for a wide range of vehicles.

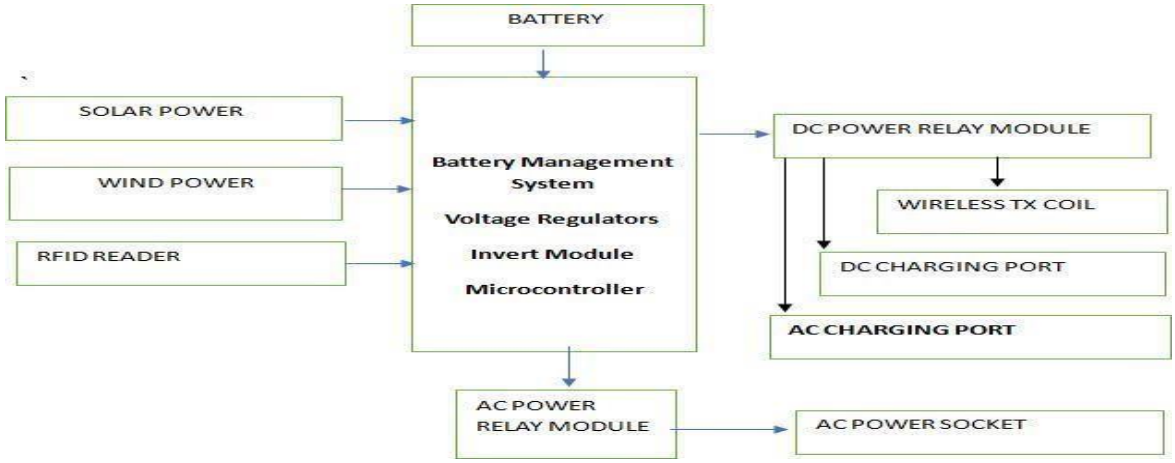



**Fig.5Blockdiagram ofMicrogridsusingRFID**

## XI.CONCLUSION

EV (Electric vehicles) is expected to be one of the inevitable of our future. They are more popular than internal combustion engine vehicles. As a first step the charging time of the EV (Electric vehicles) is less and if should be able to cover a long distance. This is reason for the expected reason of the fast-charging stations. In order to manage the potential grid while using the new load, it will minimize the negative effects on the system, there by usage of the local energy resources is inevitable . The EV (Electric vehicles) should be able to benefit from these sources effectively. In this study, a hybrid fast-charging system that is supplied by local renewable energy resourcesratherthanthegridisexamined.Theanalysisisconductedwithrealweatherstationdata. It is expected that; these systems will become morewidespread and applicable to the development offast-chargingstations.

At last, we conclude that thissystem approach minimize the pollution. It will also increase the usage of EV (Electric vehicles) as it will create pollution free environment.

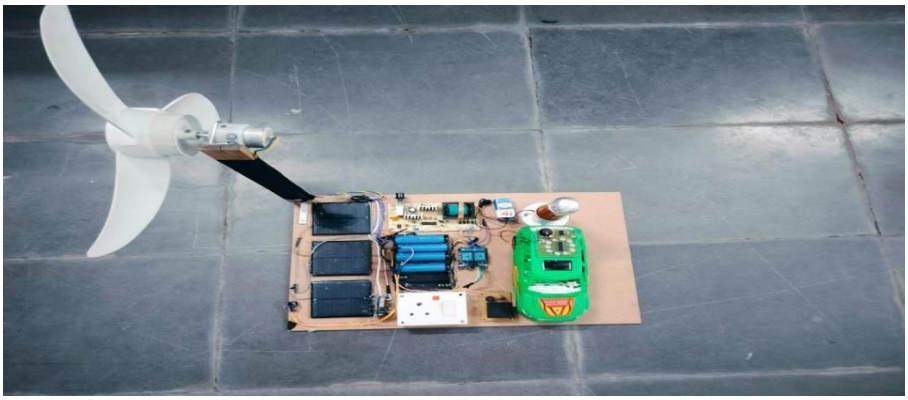


**Fig.6PictureofHardwareMicrogridUsingRFID**

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