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CONTROLLING AND MONITORING OF A HYBRID NANOGRID SYSTEM FOR DOMESTIC AND COMMERCIAL BUILDING USING IOT

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Abstract

The ever-increasing energy consumption, the exhaustible nature of fossil fuel and the worsening global environment have created booming interest in renewable energy source power generation systems.Wind and solar power generation are two of the most promising renewable power generation technologies. The growth of wind and photovoltaic (PV) power generation systems has exceeded the most optimistic estimation.Such system can be considered as a micro-grid, with its own generation sources and loads, equipped with power electronics interfaces to regulate voltage and frequency and ensure proper load sharing among the various sources.

Controllers suitable for both grid-connected and standalone applications are being developed and implemented in inverters, which could support the operation of hybrid system.Its objective is to explore control concepts and operating policies and demonstrate the feasibility of the grid-connected hybrid system using a Standalone Inverter.

Keywords: renewable power generation technologies, energy consumption.

1.PROPOSED SYSTEM

This project is the implementation of a new improved energy management system and to remove the restraints of practical implementations to enhance the drawbacks mentioned in existing schemes and to integrate the renewable energy resources with the existing dump grid in a more efficient and cost-effective manner.EMS(Energy Management system) determines the practical application of the DC-AC network with incorporation of solar PV, wind and battery storage within available infrastructure. A remarkable improvement is seen in using the hybrid AC-DC framework in terms of reliability and efficiency.

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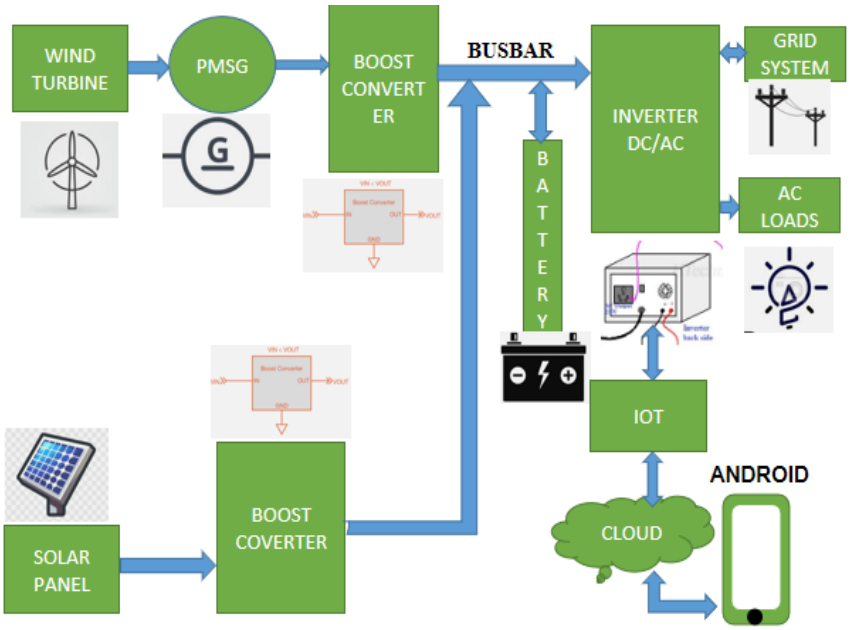

Fig1.2 Block Diagram

2.HARDWARE IMPLEMENTATION

A. IOT

The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet

Over the past few years, IoT has become one of the most important technologies of the 21st century. Now that we can connect everyday objects—kitchen appliances, cars, thermostats, baby monitors—to the internet via embedded devices, seamless communication is possible between people, processes, and things.

By means of low-cost computing, the cloud, big data, analytics, and mobile technologies, physical things can share and collect data with minimal human intervention. In this hyperconnected world, digital systems can record, monitor, and adjust each interaction between connected things. The physical world meets the digital world—and they cooperate.

B. ESP8266 NODE MCU

The NodeMcu is an open-source firmware and development kit that helps you to prototype your IoT product with few Lua script lines.The Development Kit based on ESP8266, integates GPIO, PWM, IIC, 1-Wire and ADC all in one board.

The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from existing micro controller to WiFi and is also capable of running self-contained applications.

It is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson,and spiffs.

C. curent and voltage sensor

A current sensor is a device that **detects and converts current to an easily measured output voltage, which is proportional to the current through the measured path**. When a current flows through a wire or in a circuit, voltage drop occurs. Also, a magnetic field is generated surrounding the current carrying conductor.

A voltage sensor is **a sensor used to calculate and monitor the amount of voltage in an object**. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, analog voltage signal, a current signal, or an audible signal

D. arduino

Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - 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

E. boost converter

The Boost converter has two modes of operation. The first mode is when the switch is on and conducting. The Switch is ON and therefore represents a short circuit ideally offering zero resistance to the flow of current so **when the switch is ON all the current will flow through the switch and back to the DC input source**

F. inverter

An inverter **converts the DC electricity from sources such as batteries or fuel cells to AC electricity**. The electricity can be at any required voltage; in particular it can operate AC equipment designed for mains operation, or rectified to produce DC at any desired voltage.

G. solar and wind

A solar-wind hybrid power system **uses solar insolation and wind energy to produce electricity**. As both solar radiation and wind speed vary throughout the year, neither solar nor wind based system can provide reliable electricity individually.

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H. cloud

The cloud" refers to **servers that are accessed over the Internet, and the software and databases that run on those servers**. Cloud servers are located in data centers all over the world.

A cloud server is **a pooled, centralized server resource that is hosted and delivered over a network—typically the Internet—and accessed on demand by multiple users**. Cloud servers can perform all the same functions of a traditional physical server, delivering processing power, storage and applications.

Block diagram of cloud

I. battery

In a rechargeable battery, however, the reaction is reversible. **When electrical energy from an outside source is applied to a secondary cell, the negative-to-positive electron flow that occurs during discharge is reversed, and the cell's charge is restored**.

J. relay

A relay is an electrically operated switch. They commonly use an electromagnet (coil) to operate their internal mechanical switching mechanism (contacts). **When a relay contact is open, this will switch power ON for a circuit when the coil is activated**. The example relay diagrams below show how a relay works.

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K. transformer

A transformer is **a device that transfers electric energy from one alternating-current circuit to one or more other circuits**, either increasing (stepping up) or reducing (stepping down) the voltage.

3. SOFTWARE RESULT:

3.1 INTRODUCTION

Simulink is an environment for multidomain simulation and Model-Based Design for dynamic and embedded systems. It provides an interactive graphical environment and a customizable set of block libraries that let you design, simulate, implement, and test a variety of time-varying systems, including communications, controls, signal processing, video processing, and image processing

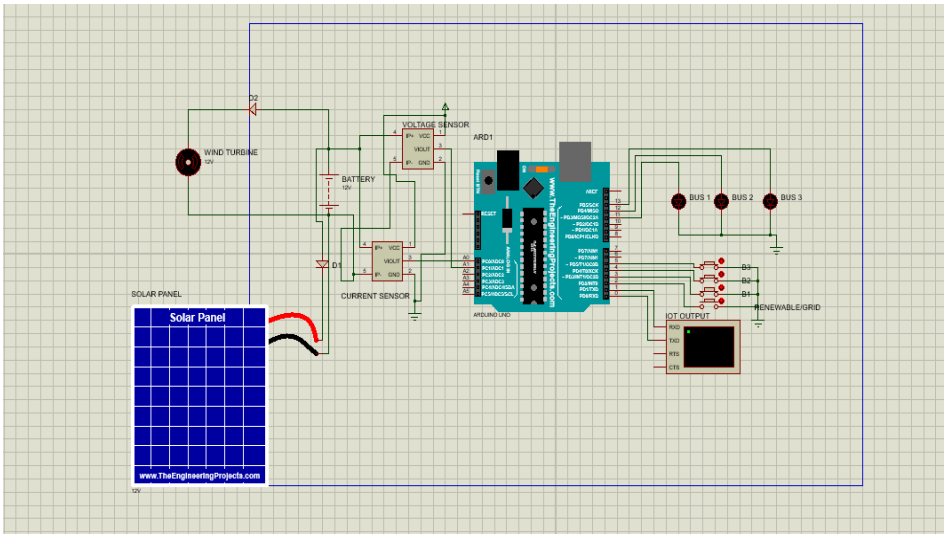

Fig 3.1 Software result

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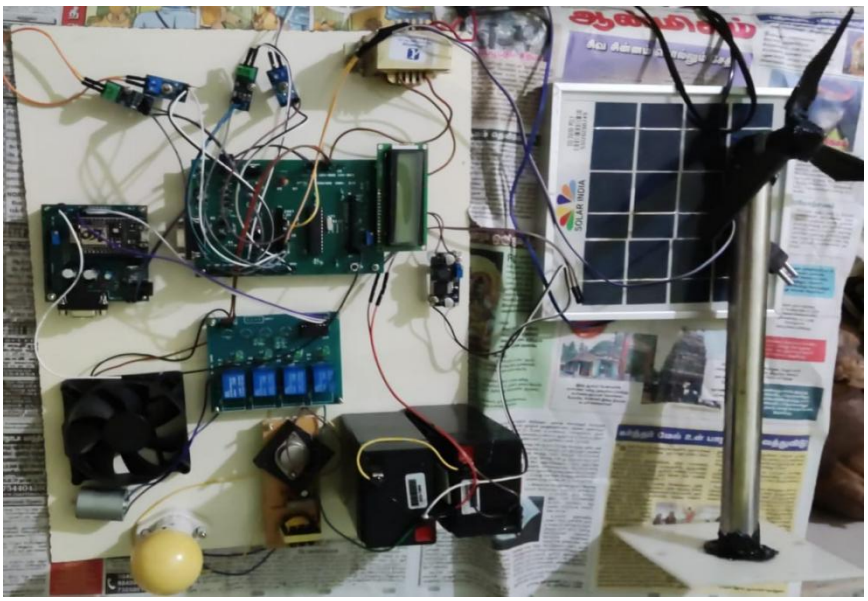
4. HARWARE RESULT



5. FEATURE

1. **Power-loss reduce in the system.**
2. **Control the both ac and dc.**
3. **Automatic control also imlpement.**
4. **Reduces the buses.**

6. CONCLISION

In conclusion, the penetration of solar systems and energy storage systems linked to the DC busbar raises the system's capital cost but significantly lowers the cost of acquired electricity from the main grid. A hybrid ac/dc Nanogrid is offered in this research as a solution for the smart house of the future. It is made up of an AC and DC network, as well as an AC/DC converter that connects them. An intelligent controller based on modified SRF was used to control the connecting converter. This control mechanism allows the connecting converter to behave as an APF, forcing the AC supply current at the PCC to be a balanced three phase current independent of the loading state or the local AC load current's degradation level. At the PCC, the controller also does harmonic mitigation and power factor correction. The system is shown to be practical, with a short payback period and a strong internal rate of return. With the option of islanding operation, it becomes more efficient and dependable in terms of powering key loads without interruption in the event of a main grid breakdown. The power quality analysis of the system, as well as the design and implementation of smart nano grid controllers for efficient system operation, taking into account the time of use tariff and other essential network factors, are the next steps in this effort. Furthermore, the installed capacity of renewable energy sources can be lowered if AC or DC loads, such as fan loads, lighting loads, refrigeration loads, heating loads, and so on, are managed efficiently and optimally. The effectiveness, efficiency, and reliability of the suggested control approach are

investigated. During the running period, the controller will be tested under severe loading circumstances to ensure that the control model is capable of handling such a load pattern.

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