IOT Based Power generation system using solar, wind and tidal energy

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Abstract

The increasing demand for clean and sustainable energy has led to a growing interest in renewable energy sources such as solar, wind, and tidal power. This paper presents a comprehensive review of the integration of solar, wind, and tidal energy sources for power generation. It discusses the potential of each energy source, their advantages and limitations, and explores the challenges and opportunities in integrating them into a unified power generation system. Furthermore, it analyzes various case studies and projects worldwide that have successfully implemented hybrid systems combining these renewable energy sources. Through this review, insights are drawn to highlight the importance of harnessing multiple renewable energy sources to meet the rising energy demands while mitigating environmental impacts.

Keywords: Solar energy, wind energy, tidal energy, renewable energy integration, IOT, hybrid power generation, sustainability.

i.Introduction

When we think about finding better ways of generating energy without harming environment, first things come into our mind is renewable energy sources. Solar, wind and tidal are the main source of renewable energy. These are all natural sources of energy that we can use instead of relying on things like coal and oil, which pollute the air and contribute to climate changes. Solar power is generated from sunlight, wind power is generated from the wind turbines, tidal power is generated from the movement of the ocean tides. Now, imagine combining these three types of energy – solar, wind, and tidal – into one big project. It's like getting the best of all worlds. By doing this, we can make sure we have a constant supply of clean energy, even when the wind isn't blowing or the sun isn't shining as bright.

Iot based power generation system helps us to monitor power generation and utilization of energy from anywhere and anytime. Combining solar wind and tidal power help us to generate more energy at a time, they help us use renewable energy in a smarter way. They also create jobs and help our communities grow while protecting the planet. By working together and using new technologies, we can make sure we have all the energy we need without hurting the Earth.

ii.Objective

The objective of this project on IOT based power generation using solar, wind, and tidal power is to establish a sustainable and reliable energy generation system that maximizes the utilization of renewable resources while minimizing environmental impact and helps us to monitor and control power generation and utilization from anywhere and anytime. It is used to promote sustainable development, address climate change, and transition towards a cleaner, more reliable energy system that meets the needs of present and future generations.

iii.Block diagram of Project

The block diagram of a system consists of solar panel, magnetic levitation based wind turbine, and mechanical system for power generation through tidal energy. The solar panel is used to convert the solar energy to electrical energy, wind turbine convert wind energy into electrical energy, and mechanical system of tidal energy convert tidal energy into electrical energy. Then these system store electrical energy into battery and further iot based controlling circuit use to display voltage, current, power, energy, capacity and temperature on oled display connected in controlling circuit and we have to display the value of current, voltage and power on blynk IOT server which helps to monitors and and control power generation from anywhere and anytime .
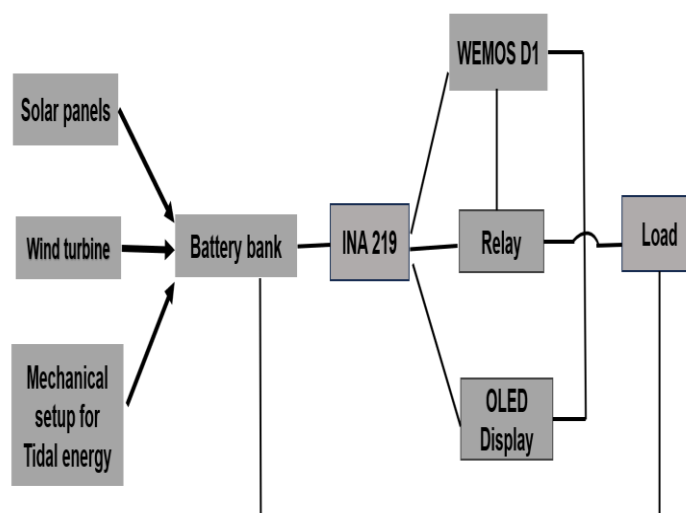
iv.Components used

1. **Solar panel**

   Solar panel is device used to convert solar energy into electrical energy. They use photovoltaic cells which are made from material like silicon. When sunlight hits these cells, it knocks electron loose, creating an electric current.

2. **Dc generator**

   A DC generator is a machine that transforms mechanical energy into direct current (DC) electricity. This means it takes energy from a rotating source, like a water wheel or engine, and uses it to produce electrical power with a constant voltage and current direction. DC generators rely on a principle called electromagnetic induction, discovered by Michael Faraday.

   1. **Magnetic field:** The generator has a magnetic field, created either by permanent magnets or electromagnets.

   2. **Conductor:** A conductor, typically a coil of wire wrapped around a rotor (spinning part), is placed within this magnetic field.

   3. **Rotation:** When the rotor spins, the conductor cuts through the magnetic lines of force.

   4. **EMF induced:** As per Faraday's Law, this motion induces an electromotive force (EMF) in the conductor, which creates a voltage.

   5. **Direct current:** If the circuit is closed, this EMF pushes electrons in a constant direction, resulting in direct current.

3. **Battery**

   Batteries are like little containers that store energy, like tiny power factories.They use chemicals inside to create electricity that can run all sorts of things, from your phone to your flashlight. There are two main types: disposable batteries (like AA or AAA batteries) that you throw away once they're used up, and rechargeable batteries (like the one in your phone) that you can plug in to refill the energy.

4. **WEMOS D1**

   The Wemos D1 Mini is a tiny but powerful development board that lets you build projects that connect to the internet. Here's the breakdown:

   - Size: Really small - think about the size of your thumb!
   - WiFi: Connects wirelessly to the internet.
   - Coding: Can be programmed using popular platforms like Arduino IDE.
   - Projects: Great for beginners to learn electronics and build internet-connected things.

   Here are some of its key features:

   - Microcontroller: ESP8266 chip - the brain of the board.
   - Pins: Has multiple pins for connecting LEDs, sensors, and other electronics.
   - Power: Can be powered by a USB cable or a battery.

5. **INA 219**

   The INA219 is a handy little chip that helps you monitor current, voltage, and power. It's particularly useful for applications involving batteries or solar panels.

   Function: It acts as a current shunt and power monitor. That means it measures the tiny voltage drop across a resistor (called a shunt) that's placed in a circuit. By measuring this voltage drop, it can

calculate the current flowing through the circuit. It can also measure the voltage across the circuit. With both voltage and current readings, it can then calculate the power being used.

6. Relay

A relay has a little electromagnet (like a mini super strong magnet you can make with a coil of wire and electricity). It also has a switch with contacts that can be connected or disconnected. When you give the relay a small electric nudge (like flipping a switch), the electromagnet gets turned on. This magnet then moves the switch contacts, connecting or disconnecting them.

7. OLED Display

Tiny light bulbs made of special materials (like fancy carbon molecules) light up themselves when you give them a little zap.

Because each light bulb lights up on its own, OLED screens can turn them completely off for perfect blacks. This makes for super sharp pictures, especially in dark scenes.

Regular screens use backlights and filters, which can make blacks look grayish. OLED doesn't need that, so blacks are much deeper.

v.Hybrid power generation

Combining solar, wind, and tidal power generation within the same hybrid energy project, the system can achieve greater reliability and stability of energy supply compared to relying on any single source alone. Nature of these renewable sources ensures a more consistent energy output throughout the day and across different weather conditions, reducing the need for backup power or energy storage systems.This project utilize solar, wind, and tidal power offers a sustainable solution for clean electricity generation, contributing to carbon emissions reduction and energy independence while harnessing the natural resources of the ocean environment, minimizes land use conflicts and enhances resource utilization in coastal areas.

vi.Working of project

Our project work on the principle of hybrid energy generation, as the wind does not blow all the time nor does the sun shine all the time, so this project based on hybrid energy generation using solar,

wind and tidal power.

Project consist of solar panel which convert sunlight into electrical energy and wind turbine which works on the principle of magnetic levitation, when wind blow, the blades of wind turbine rotate and generate electrical energy and mechanical system of tidal energy generation work on the principle that when ocean waves strike on the mechanical system, the up down motion rotates the dc generator and dc generator convert mechanical energy into electrical energy. This energy store in battery and iot based controlling circuit further analysis the power generation and display the value of current, voltage, power, energy and temperature on oled display connected in the circuit . Load is connected in the circuit which is controlled by mobile or laptop through the server and monitor the values which shown in oled display.

This system provide energy in all climate condition because ocean waves present and wind flow in coastal areas all time.

vii.IOT server

In this project we have to use blynk server to make project IOT based. Blynk offers controlling your hardware project. It involves connecting your hardware project to the internet and then using the Blynk app (available for iOS and Android) to control it remotely from anywhere with an internet connection.

You don't need to set up or maintain your own server; everything is handled by Blynk's infrastructure. Servers shows the value of current, voltage, power, capacity and temperature on there application and also we can switch on or off load according to need .

viii.Result analysis

This project on IOT based hybrid energy generation produce energy from solar panel about 9 to 10 volt, from wind turbine about 1.5 volt and from tidal energy about 1.2 volt . This voltage stored in battery and further IOT based controlling circuit display the value shown below.
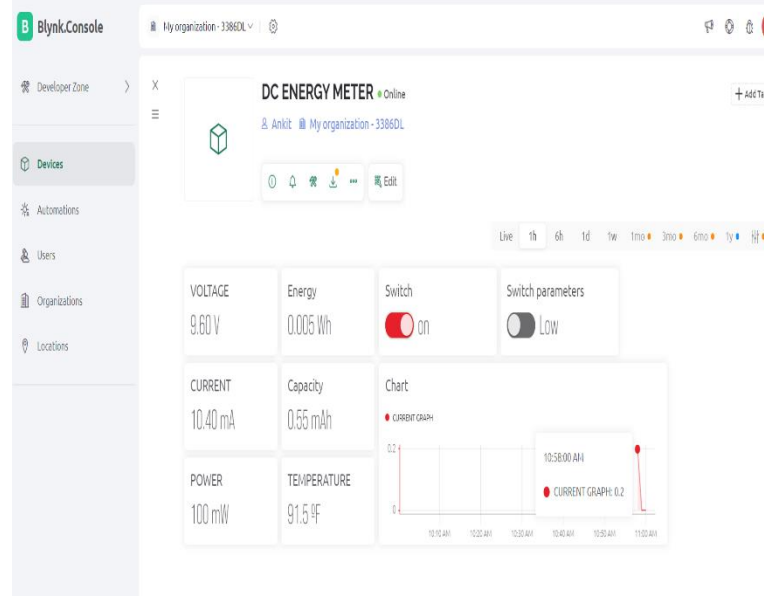
ix.Conclusion

Solar, wind, and tidal power for generating electricity is a great idea for the future. These sources give us energy without harming the environment. Solar power comes from the sun, wind power from the wind, and tidal power from

ocean tides. Integration of solar, wind and tidal energy sources together give more benefits than single source of energy. The iot based project model for power generation offers a promising pathway towards a cleaner and more sustainable energy future. By using these sources, we can make sure we have clean and reliable energy for a long time.

But to make this happen, we need to keep improving the technology and building better

infrastructure. We also need supportive rules and laws.

If we work together and keep investing in these types of energy, we can make our world cleaner and better for everyone.

x.References

1. Vishu A. Bhoi, Kalyani P Bhorkade, Pooja B. Dhawale, Shrutika P. Gore, Prof. S. S. Dawange "Dual Energy Generation Using Solar and Wind Energy" (2022).

2. Md Zeeshan Malik, Kanza Zehra, Mazhar Hussain, Baloch "Solar-Wind Hybrid Energy Generation System" (2020)

3. Nishant Jha, Deepak Prashar, Mamoon Rashid, Zeba Khanam, Amandeep, Nagpal, Ahmed Saeed, Al Ghamdi Sultan S, Alshamrani "Energy-Efficient Hybrid Power System Model Based on Solar and Wind Energy for Integrated Grids" (2022).

4. Neel Kamal "Integrated solar-wind power tracking system for grid" (2018).

5. Pragya Nema, Rajesh Nema "PV-solar/wind hybrid energy system for GSM/CDMA type mobile telephony base station" (2010)

6. Dr. Mir-Akbar Hessami "Designing a hybrid wind and solar energy supply system for a rural residential building" .

7. https://www.google.com/search?q=Dual+energy+generation+using+solar+and+wind+enery&oq=Dual+energy+generation+using+solar+and+wind+energy&aqs=chrome..69i57.30544j0j15&sourceid=chrome&ie=UT F-8.