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# Hybrid Energy Management and Battery Optimization along with IoT- System

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**ABSTRACT:** This challenge presents the development of an incorporated hybrid renewable electricity system that mixes wind and sun strength with IoT-enabled monitoring and control for efficient energy management. The gadget is designed to harness wind power generated with the aid of the movement of cars on highways, making use of strategically positioned vertical-axis wind turbines alongside the toll road medians to capture airflow from both directions. In parallel, solar panels are deployed to accumulate solar power all through daytime, mainly throughout summer time seasons whilst sun irradiance is excessive. The hybrid gadget intelligently prioritizes strength inputs: when solar panel voltage exceeds 3V DC, the sun power module is activated in addition, whilst wind-generated voltage exceeds 1V AC, the wind power module is prompt. an internet of factors (IoT) platform, using the ThingSpeak web interface, continuously video display units key machine parameters including wind and solar voltages, battery degrees, and machine activity.

# I. INTRODUCTION

The increasing worldwide call for for easy and sustainable power has caused the exploration of hybrid renewable energy systems that combine multiple assets to make sure performance, reliability, and reduced environmental effect. This mission specializes in the development of an integrated hybrid power device that mixes each wind and sun energy, greater with IoT-based tracking and manage for sensible electricity control. The machine is uniquely designed to seize wind electricity produced by way of automobiles transferring at excessive speeds on highways, making use of vertical-axis wind turbines located strategically on motorway medians to collect airflow from both directions. simultaneously, sun panels are employed to harness solar energy during sunlight hours, specially in the summer whilst sun irradiance is at its height. to triumph over the intermittency of those renewable assets specifically the reduced wind availability in wintry weather a robust battery garage device is incorporated to shop extra energy and ensure non-stop electricity supply.

# **II. LITERATURE SURVEY**

# [1] Y. Bao, ok. Chen, N. Cheung, S. Ho., Experimental examination on a brand new switched reluctance wind strength generator machine for electric powered motors, 2021.

Studied experimental exam on a brand new switched reluctance wind electricity generator gadget. in this examine, a technique of harnessing wind strength on-board of an electric powered car using switched reluctance generator (SRG) coupled to a wind turbine, that's installed on the vehicle is discussed.

# [2] S. Ani, H. Polinder, J. Ferreira, Small wind strength technology the use of car alternator, 2020 explained concept of small wind electricity technology the use of automotive alternator.

Implementation of domestic solar-Wind Hybrid strength machine", 2021. it's far the designed circuitry. The feature of most Charged Battery selection is to decide the maximum strength quantity of electrically stored in person batteries. most Charged Batter choice is usually joined inside the circuit of the inverter. thus, the block of inverter surrounds the maximum Charged Battery choice.



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# [3] M. Fatin Ishraque, S. A. Shezan, M. M. Ali, 2021

To help construct a pollutants-loose better global, using renewable resources of energy has no alternatives. Renewable sources can be efficiently applied for the generation of electrical electricity.

# **III. EXISTING & PROPOSED SYSTEM**

# **1.EXISTING SYSTEM:**

The Hybrid power era device is to deliver power to ICT infrastructures, hospitals and different locations in a ways-off and rural regions that don't have any reference to countrywide Grid energy supply. on this technique the strength can be stored and monitored for further reference, this will be attained via the relationship of the hybrid gadget with the grid to get fluctuation loose electric strength. In current model, the sun panel receives input from the solar radiation and produces electrical power as output. here, sun panels are acting as a medium between the conversions tactics of solar energy into electrical strength. The electricity produced will be transferred to the battery and might be stored inner for in addition usages.

## **1.1. DISADVANTAGES:**

There's a likely of power wastage and the power isn't always produced constantly because of fluctuations.. as the machine doesn't contain any controller movement.consequently, the circuit layout is complicated.

#### 2.PROPOSED SYSTEM:

The proposed machine is a smart hybrid renewable energy answer that integrates each wind and solar energy assets, designed particularly to help sustainable public infrastructure such as toll road lighting. This machine captures wind electricity generated by way of the motion of motors on highways thru vertical-axis wind generators strategically established on highway medians, taking advantage of airflow from each directions. In addition, sun panels are set up to harness daylight for the duration of the day, especially for the duration of excessive-radiation periods like summer time. To address the variety in strength era, particularly during seasons with less wind or sunlight, the system consists of a battery storage unit that stores extra electricity for continuous and dependable strength transport. The device is programmed to set off the sun power module whilst the sun panel voltage exceeds 3V DC, and the wind power module while wind voltage exceeds 1V AC. This ensures power is applied efficiently based totally on environmental availability. The proposed setup offers a strong, low-renovation, and answer for renewable strength utilization, aligning with current power sustainability goals.

#### 2.1 ADVANTAGES:

The proposed hybrid renewable energy machine gives several key blessings. It makes use of both wind and solar energy, ensuring steady electricity generation in the course of the day and throughout seasons. Battery garage guarantees uninterrupted energy supply all through low wind or sunlight situations. usual, the device is , reduces dependency on fossil fuels, and helps sustainable public infrastructure.



## **BLOCK DIAGRAM:**

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Fig No:2 Thingspeak Block Diagram

# **IV. HARDWARE REQUIREMENTS:**

#### 1. LIQUID CRYSTAL DISPLAY:

Liquid crystal display stands for Liquid Crystal show. liquid crystal display is locating huge unfold use replacing LEDs (seven phase LEDs or different multi phase LEDs) due to the following reasons: 1. The declining prices of LCDs. 2. The ability to show numbers, characters and images. this is in evaluation to LEDs, which are confined to numbers and a few characters. three.



# Fig. No:3.LCD Display

# **2.BATTERY:**

The BATTERY extends using a PV-machine's generated power and will offer free, sustainable energy even if the sun isn't always shining and the panels don't produce power.therefore, with a BATTERY little to no energy is fed into the grid even as additionally fending off having to buy luxurious energy from the grid later. you'll pay much less in keeping with used kWh.Batteries are a collection of 1 or extra cells whose chemical reactions create a go with the flow of electrons in a circuit. whilst the anode and cathode of a battery is attached to a circuit, a chemical reaction takes vicinity among the anode and the electrolyte. At that factor, your battery is "useless."Batteries that need to be thrown away after use are referred to as number one batteries. Batteries that may be recharged are referred to as secondary batteries.



Fig. No:4.Battery

## **3**.LIGHT:

The electric bulb plugged into the integrated bulb holder of this match-and-overlook tool wakes up at dusk and ticks over just after the first mild of day. The device may be used to pressure an ordinary incandescent bulb, a light ballast, or a stable-state lighting fixtures fixture working on a modern less than or same to 5A at 230V, 50Hz..Lighting



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fixtures specification acts as the bridge among layout conceptualization and the completed product, with out which it is hard to articulate the whole thing that we require for a project.



Fig no.5.Light

#### 4. RELAY:

A relay is an electrical transfer that opens and closes under the manage of every other electrical circuit. within the unique shape, the switch is operated with the aid of an electromagnet to open or near one or many units of contacts. It changed into invented through Joseph Henry in 1835.



Fig No:6. Relay

## 5. WIND MOTOR:

Geared DC automobiles may be defined as an extension of DC motor which already had its perception information demystified right here. using the ideal combination of gears in a equipment motor, its speed can be decreased to any ideal determine. This idea wherein gears lessen the velocity of the car but boom its torque is known as gear reduction. This perception will discover all of the minor and important information that make the equipment head and as a result the running of geared DC motor.



Fig no:7. Wind motor



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# V. RESULT

The implementation of the hybrid renewable power gadget yielded promising effects, validating the effectiveness of mixing wind and solar power for sustainable strength generation. The wind turbines efficiently captured airflow generated with the aid of shifting automobiles along the toll road, generating measurable AC voltage when wind speed surpassed a realistic threshold, with activation occurring continuously above 1V AC. simultaneously, the sun panels proven efficient strength harvesting in the course of sunlight hours, with the solar module reliably activating whilst the voltage exceeded 3V DC. The integrated battery garage device effectively stored surplus electricity from both assets, making sure uninterrupted strength supply throughout durations of low sunlight or wind hobby. The IoT-based totally tracking device the usage of the ThingSpeak platform functioned as it should be, imparting actual-time statistics visualization of key parameters inclusive of wind voltage, solar voltage, and battery stages. This enabled far flung tracking and ensured proper machine response to various energy inputs. typical, the gadget met its performance targets, proving to be a dependable, sensible, and solution for renewable electricity utilization in public infrastructure applications.



Fig No: 8 LCD Display on DC load

Fig No:9 Voltage Monitor in Graph



Fig No:10 Overall Kit



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## VI. CONCLUSION

In end, the proposed hybrid renewable power device efficiently demonstrates the integration of wind and solar energy with shrewd IoT-primarily based monitoring to offer a sustainable and efficient power solution for public infrastructure needs which includes dual carriageway lighting. by way of shooting wind energy generated with the aid of car movement and harvesting sun power at some point of the day, the machine ensures continuous energy technology. The IoT-enabled ThingSpeak platform enhances the system's capability by imparting real-time tracking, information logging, and automated control based on set voltage thresholds activating the sun module at 3V DC and the wind module at 1V AC. This mission now not best maximizes using locally to be had renewable resources but also promotes the adoption of smart and clean power technologies. It affords a scalable, model that contributes meaningfully to international efforts in lowering carbon emissions and transitioning toward sustainable electricity infrastructure.

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