International Journal of Creative and Open Research in Engineering and Management
ISSN: **3108-1754 (Online)**
Volume 02 Issue 05 May-2026 | Impact Factor: 3.5

IOT-Based Hybrid Renewable Ship Energy System

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How to Cite this Article:

Muthukumaran, S. .., Kumar, R. P., Santhoshkumar, & Vinothkumar, V. (2026). IOT-Based Hybrid Renewable Ship Energy System. International Journal of Creative and Open Research in Engineering and Management, 02(05). https://doi.org/10.55041/ijcope.v2i5.216

https://doi.org/10.55041/ijcope.v2i5.216

ABSTRACT:

Marine vessels usually use diesel generators to get power when they're at sea. This means they use a lot of fuel which costs a lot of money and also hurts the environment. These systems are not very good because they only use one kind of energy and it is hard to keep track of how much energy's being used. The people in charge of the vessel have to do everything by hand which can lead to wasting energy and the vessel not working well as it should.

The new system for vessels is called the IoT-Based Hybrid Renewable Ship Energy System. This system uses panels and wind turbines to make clean energy. This energy is then. Managed using a special platform that is connected to the internet. This platform is always checking the health of the batteries and how much power is being used. When the batteries are running low the system automatically starts using the energy sources to charge them. This makes sure that energy is being used in the way possible.

The system also has a sensor that uses sound waves to detect things that might be in the way of the ship. This helps keep the people on the ship safe. The status of the ship is also shown on a screen, which makes it easier for the people in charge to navigate. The IoT-Based Hybrid Renewable Ship Energy System is an improvement, over the old systems because it uses IoT-Based Hybrid Renewable Ship Energy System to make clean energy and it helps keep the people on the ship safe. The IoT-Based Hybrid Renewable Ship Energy System is a way to make marine vessels more efficient and better for the environment.

This way of doing things changes the systems that use a lot of fuel into something that is better for the earth.

It makes an automated system, for energy that helps cut down on things going into the air makes things work better and helps the maritime operations be more sustainable. The maritime operations become more eco-friendly with this approach the maritime operations reduce emissions the maritime operations improve efficiency and the maritime operations support sustainable maritime operations.

KEYWORDS: Hybrid renewable energy, IoT monitoring, smart battery management, obstacle detection, sustainable shipping.

I . Introduction

This paper is about an energy system for ships that uses solar panels and wind turbines. It also has a system to manage energy. This system checks the batteries. How much power is being used all the time. It makes sure we use energy in the way possible by controlling things automatically. The system also has safety features like sensors that detect obstacles and a display that shows what is happening in time. This helps people navigate and know what is going on with the ship.

The new energy system for ships is meant to be good for the environment and work well. It uses fuel and is smarter which makes shipping better for the environment. It also makes ships more reliable and work overall. The solar and wind power system is a way to make shipping more sustainable. The Internet of Things technology makes it possible to monitor and control the energy system in time. This is an improvement for marine vessels. The new system is a solution for ships because it uses renewable energy sources, like solar and wind power.for getting things from one place to another all around the world.. It relies a lot on old fashioned diesel power systems. These systems use a lot of fuel which means they are expensive to run. They also make a lot of pollution.

Traditional energy systems on ships are not very good. They usually get their power from one source and they do not have many automatic controls. This means they do not use energy well which leads to waste and the systems are not very reliable.The maritime industry needs to change. People want things that're better for the environment. So we need to make the energy systems, on ships smarter and more efficient. We need to make maritime energy systems better. Maritime energy systems have to be updated to be more efficient and to work better.

In the few years solar and wind power have become good options for reducing our use of fossil fuels. At the time we can use the Internet of Things technology to monitor and control energy systems in real time. This can make a difference in how well energy systems work, especially on ships.

This paper is about a system that combines solar panels and wind turbines with a smart energy management system. The system checks the batteries. How much power is being used all the time so it can make sure we are using energy in the best way possible. It also has safety features like sensors that can detect obstacles and a display that shows what is happening in time which makes it easier to navigate and be aware of what is going on.

The new system is meant to provide a way for ships to use energy that is sustainable and automated. By using fuel and making the system smarter it helps the environment and makes shipping better and more reliable. The solar and wind power system is a way to reduce our dependency on fossil fuels and make shipping more efficient. The Internet of Things technology is also important for making the system work well so we can have an energy system, for marine vessels.

II . Existing work

The environmental impact of transportation is getting worse and this has led to a lot of research on sustainable and energy efficient ship systems.Ship power systems usually rely on fuels which is a big problem because it leads to high emissions and the systems do not work

very well.To deal with these problems people have been studying how to use energy sources and smart energy management systems and techniques to monitor ships using the internet.

Now people are looking at energy systems that use many different energy sources like solar power and wind power and fuel cells and batteries.These hybrid energy systems make ships more energy efficient by using the energy sources that're available at the right time.For example some ship power systems that use fuel cells and energy storage units have been shown to be more efficient and stable. They use less fuel because they have good energy management strategies.People use techniques, like rule-based control and logic and optimization algorithms to make sure the power is distributed effectively to the maritime transportation ship systems and the hybrid energy systems and the ship power systems.The maritime transportation ship systems and the hybrid energy systems and the ship power systems are very important. People are doing a lot of research on them to make them more sustainable and energy efficient.

The thing is In addition people have made ship microgrids that use energy to reduce the need for diesel generators. These systems use panels, wind turbines and energy storage devices all working together in a special setup. The energy management systems use controllers that can pick the best energy source and keep the power on even when the renewable energy is not available all the time. Using Internet of Things technology in energy systems has also made it easier to monitor and control things. Systems that use Internet of Things let us track how much energy is being used, the health of the batteries and how well the system is working in time. Studies show that using Internet of Things makes energy systems more efficient, automated and easier to maintain which makes them smarter and more sustainable. Moreover new technologies like machine learning and Internet of Things are being used to track emissions and optimize energy use in ports, which really reduces the harm to the environment.

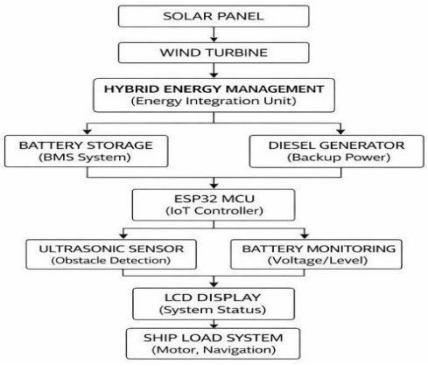
Energy storage systems are also very important for ship power systems. Research on batteries and hybrid storage solutions shows that using batteries with special devices called ultracapacitors makes the system more reliable helps with changes in energy use and improves overall energy performance.

III . Proposed Method

The proposed system is a Based Hybrid Renewable Ship Energy System. This system uses panels and wind turbines to generate clean energy for ships. The system has an ESP32 microcontroller that collects data from sensors. These sensors check the battery to see how voltage, current and temperature it has.The system also has a Battery Management System. This system makes sure the battery is safe, by not letting it overcharge discharge much or get too hot. When the battery level goes down the system starts using energy to charge it.

The system also has a sensor. This sensor helps the ship navigate safely by finding things in its way. It then shows the status of the system on an LCD screen. The IoT-Based Hybrid Renewable Ship Energy System is a way to make ships work better. It uses energy, smart monitoring and automated control to make the ship work well and not hurt the environment.The IoT-Based Hybrid Renewable Ship Energy System can be checked from away through a dashboard. This helps keep the ship safe by finding things in its way and showing the status of the system on an LCD screen. The IoT-Based Hybrid Renewable Ship Energy System is a way to make ships work better. It uses energy, smart monitoring and automated control to make the ship work well and not hurt the environment.

System flow chart



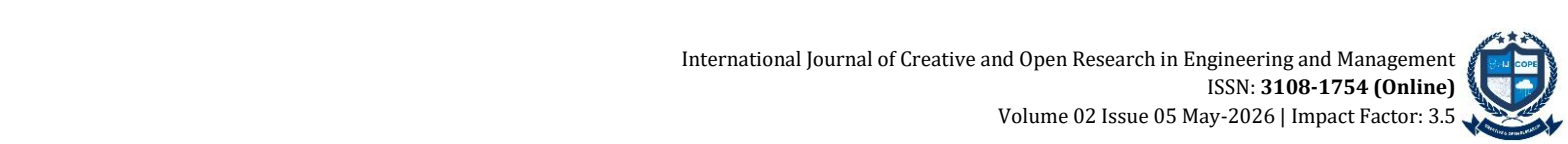


Fig 1. System flow chart

Block Diagram

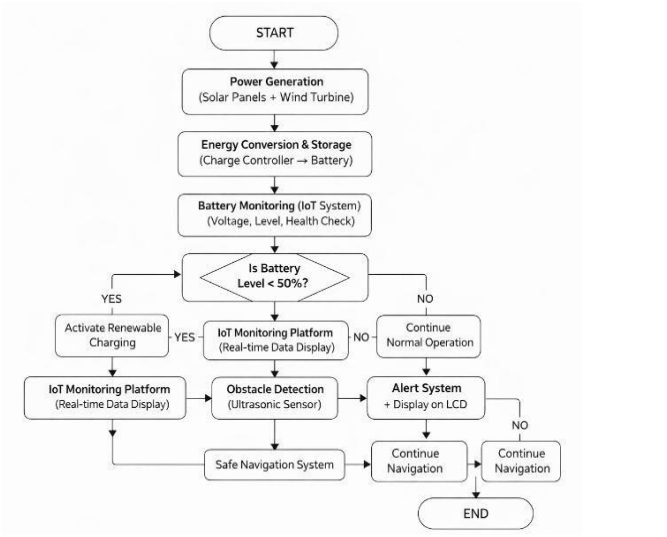


Fig2.Blockdiagram

The block diagram shows a based hybrid renewable energy system for ships. This system uses wind energy to give ships continuous and efficient power. The goal is to make sure the energy supply is reliable reduce fuel use and make monitoring easier.The process starts with panels and wind turbines. They make energy from sunlight and wind. This energy goes into an energy management unit. This unit. Controls power from different sources. It makes sure the energy is used in the way.The energy then goes to two parts: battery storage and a diesel generator backup. The battery storage saves energy for later. The diesel generator gives backup power when the renewable sources are not enough.An ESP32 microcontroller is the controller. It watches the energy flow controls things and has features for monitoring from far away. It gets data from sensors, like the sensor and battery monitoring system.

The ultrasonic sensor helps detect obstacles. This keeps the ship safe when navigating. The battery monitoring system checks the voltage and charge levels. This keeps the battery healthy. Working well.All the system data is shown on an LCD display. It shows what is happening in time. The energy then goes to the ships systems. This includes motors and navigation equipment that the ship needs to work.The system has a panel and wind turbine to make renewable energy. The solar panel and wind turbine are the energy sources.The hybrid renewable energy system helps ships use fuel and have a reliable energysupply.TheESP32 microcontroller and sensors help make sure everything works well.The battery storage and diesel generator backup make sure the ship always has power.

1. Solar Panel

The solar panel takes sunlight. Turns it into electrical energy using special cells called photovoltaic cells. This is a part of getting energy from natural sources and it really helps reduce our need for other kinds of energy.

2. Wind Turbine

The wind turbine makes electricity from the wind. It works well with power especially when the sun is not shining very much so we can keep getting energy all the time.

3. Hybrid Energy Management System

This system puts together energy from the sun and the wind. It makes sure the energy is used in the way possible and it always tries to use the natural energy sources first so we can save as much energy as we can.

4. Battery Storage (BMS System)

The battery saves energy that the solar panel and wind turbine make. The Battery Management System makes sure the battery is charged and used safely. It helps the battery last longer.

1. Diesel Generator (Backup Power)

The diesel generator gives us power whether sun and wind are not enough and the battery is empty. It makes sure we always have power even when the other sources are not

working.

2. ESP32 Microcontroller (IoT Controller)

The ESP32 is like the brain of the system. It controls everything looks at the information from the sensors and lets us monitor and talk to the system using the internet.

3. Ultrasonic Sensor (Obstacle Detection)

This sensor uses waves to find things that are in the way. It helps keep us safe when we are navigating the ship.

4. Battery Monitoring System

This system always checks the battery to see how energy it has and how much it is being used. It helps us not use much energy from the battery so it does not get damaged.

5. LCD Display (System Status)

The LCD display shows us what is going on with the system now like how much energy we have and if there are any problems. This makes it easy, for the people running the system to keep an eye on everything.

6. Ship Load System (Motor, Navigation)

This is the part of the system, where the energy is used to power the motors and navigation systems of the ship. It makes sure the ship runs smoothly and uses energy in the way possible.

VI. Results and Discussion

We tested our IoT-Based Hybrid Renewable Ship Energy System and looked at how well it works.
The system uses panels and wind turbines to make energy.

These renewable sources make a lot of energy when the sun shines and the wind blows.

This means we don't have to use much fuel from traditional sources.

One thing we noticed is that our system is good at using energy from both wind sources.

It switches to battery storage or a diesel generator when it needs to.

This helps us not waste energy.

The Battery Management System helps keep the batteries healthy by not overcharging them.

This makes the batteries last longer.

We used an ESP32 microcontroller with IoT to watch and control the system in time.

It sends data like battery voltage and energy levels to a display.

This helps the operators make decisions and fix problems fast.

The LCD display shows information on the system.

Our system is more reliable because it has sources of energy.

If solar energy is low the wind turbine helps make energy.

If both don't work the generator kicks in.

This keeps the power on all the time.

It's good for boats because it works well in environments.

We also saved fuel by using energy.

This saves money. Helps the environment.

It's good for boats. Helps reduce bad things we put in the air.

The ultrasonic sensor helps prevent crashes by

measuring distances.

The battery monitoring system helps prevent problems with the batteries.

Overall our system works well is reliable and good for real-time use.

It helps boats use energy in a way by combining renewable sources with IoT monitoring.

The system is energy-efficient and suitable, for ship energy management.

It provides a solution by using solar panels, wind turbines and IoT-based monitoring.

V . Conclusion

This paper presented a ship energy system that uses a mix of solar power, wind power, batteries and a diesel generator. The goal is to make ships more energy-efficient and environmentally friendly.
Using power and wind power reduces the need for fossil fuels. This leads to costs and less harm to the environment. The system manages energy smartly to make the most of whats available.

The system uses a computer chip called ESP32 to connect to the internet. This allows people to monitor the system in time and fix problems quickly. It makes the system more reliable and safer.

The system also has safety features like sensors to prevent collisions. It monitors the batteries to make sure they're working properly and last longer.

Overall this new system is a solution for ship energy management. It helps ships be more eco-friendly and can be made better with new technologies like artificial intelligence.

The system uses technology, renewable energy sources and energy management to achieve its goals. Renewable energy sources are used to power the system. Energy management is crucial, for the systems efficiency. The IoT technology enables real-time monitoring and control.

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