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Water Powered Hydrogen Electricity Generator

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Abstract: *This project focuses on developing a hydrogen electricity generator powered by water. It uses electrolysis to split water into hydrogen and oxygen, with hydrogen serving as a clean fuel alternative to fossil fuels. The system is designed to work with renewable energy sources like solar or wind, making it environmentally friendly. The hydrogen produced can be stored and used for power generation, while oxygen is either released or repurposed.*

Key components, such as durable electrodes, an efficient electrolyte, a stable power supply, and secure storage, are carefully selected to ensure safe and effective operation. The system undergoes rigorous testing and improvements to enhance its efficiency and reliability. This project demonstrates a practical method for hydrogen production, offering a sustainable energy solution. By addressing storage and safety concerns and integrating with renewable energy, it contributes to the advancement of hydrogen-based clean energy technologies

Keywords: Hydrogen Generator, Water Electrolysis, Renewable Energy, Power Generation

I. INTRODUCTION

The Water-Powered Hydrogen Electricity Generator project explores a sustainable way to produce hydrogen fuel from water using the process of electrolysis. Hydrogen is a clean and renewable energy source with the potential to replace fossil fuels, reducing environmental pollution and greenhouse gas emissions. This project aims to design a system that uses electricity, preferably from external DC source, to split water into hydrogen and oxygen. The hydrogen generated can then be stored and used as a versatile fuel to inject in engine which helps to run the engine to produce mechanical energy and further it is coupled with armature to generate electrical energy. By focusing on a clean energy approach, this project contributes to the development of eco-friendly technology, promoting a shift toward sustainable and renewable energy sources for a healthier planet.

II. PROBLEM STATEMENT/ OBJECTIVE

The objectives of the project are as follows:

1) Develop a system that generates electricity using hydrogen extracted from water.
2) Use renewable energy sources, like solar or wind, to power the hydrogen extraction process.
3) Ensure the process produces clean energy with no harmful emissions.
4) Make hydrogen a reliable fuel source for various applications, including homes, businesses, and vehicles.
5) Enable energy storage by converting excess renewable energy into hydrogen for later use.
6) Reduce dependence on fossil fuels by offering a sustainable alternative.
7) Contribute to reducing greenhouse gas emissions and combatting climate change.
8) Create a stable and versatile energy system that supports energy needs even during peak demand.
9) Support global efforts toward clean, renewable energy and environmental protection.
10) Develop a technology that can benefit areas with limited or unstable power grid access.

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III. PROPOSED METHODOLOGY

The methodology for the "Water-Powered Hydrogen Electricity Generator" project involves several key steps, from generating hydrogen through electrolysis to using the generated hydrogen for power production via combustion. The following outlines the process:

Electrolysis of Water:

- Water electrolysis is performed by applying an external DC power supply to two electrodes submerged in water. This process splits water into hydrogen and oxygen gases. The reaction is represented as: $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$
- The external DC power supply is carefully regulated to control the rate of electrolysis and ensure efficient hydrogen production.

Hydrogen Storage:

- The hydrogen gas produced in the electrolysis process is collected and stored in a pressurized storage container, ensuring safe storage and easy retrieval when required for combustion.

Hydrogen Combustion for Power Generation:

- The stored hydrogen is fed into a combustion engine designed to burn hydrogen. The hydrogen reacts with oxygen from the air, creating heat and water vapor. This reaction powers the engine, which generates mechanical energy.
- The mechanical energy produced by the combustion is then converted into electrical energy through a generator.

Electricity Generation:

- The generator converts the mechanical energy produced by the engine into electrical power. The output is monitored, and the efficiency of the electrical conversion is assessed.

System Optimization:

- The efficiency of the electrolysis, hydrogen combustion, and electricity generation processes are evaluated and optimized. Parameters such as the rate of hydrogen production, combustion efficiency, and electrical output are adjusted for maximum performance.

Safety and Environmental Considerations:

- Safety measures are incorporated throughout the system, including pressure relief valves and gas detectors for hydrogen storage and handling.
- The combustion of hydrogen produces only water vapor, ensuring minimal environmental impact.

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IV. BLOCK DIAGRAM

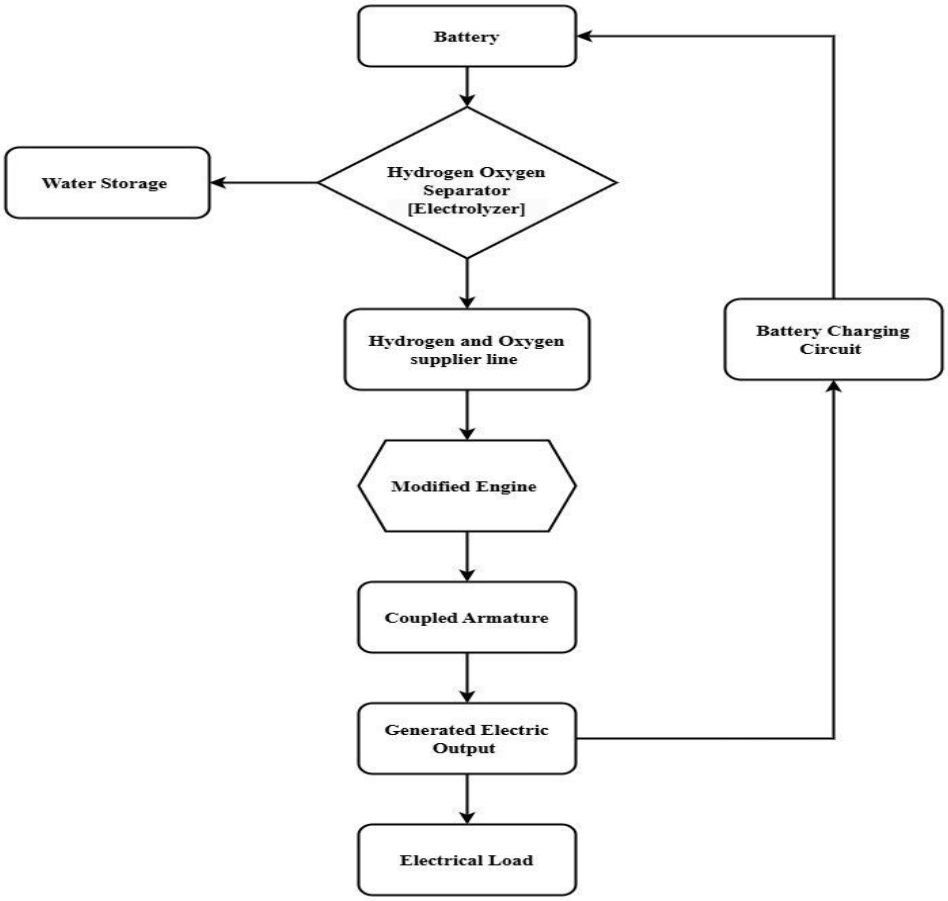

Fig. 1 Block Diagram Of WPHEG

V. CONCLUSION

The "Water-Powered Hydrogen Electricity Generator" is an innovative and eco-friendly solution that uses water as a hydrogen fuel source to generate electricity. By splitting water into hydrogen and oxygen through electrolysis, this system provides clean power with water vapor as the only byproduct, making it a sustainable alternative to fossil fuels. Its adaptability allows for applications such as off-grid power generation, industrial backup, and integration with renewable energy sources like solar and wind, where hydrogen can store excess energy for later use. This versatility supports energy independence and resilience in areas with limited access to traditional power sources.

Despite its advantages, the system has some limitations, particularly the energy required for electrolysis and challenges in safely storing hydrogen. Electrolysis can be costly if powered by non-renewable sources, and hydrogen storage requires careful safety measures, adding complexity to the system. While hydrogen combustion is cleaner than fossil fuels, its efficiency is lower than direct electrochemical conversion methods.

In summary, the "Water-Powered Hydrogen Electricity Generator" represents a promising step toward sustainable energy by using water as a clean hydrogen source, reducing carbon emissions, and offering a versatile power solution.

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With future advancements in efficiency and hydrogen storage, this technology has the potential to play a significant role in achieving a greener, more resilient energy future.

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