Advanced Traffic Volume Study with Street Electricity Generation Using Wind Power

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ABSTRACT

This research presents an innovative approach that integrates traffic volume studies with electricity generation using wind energy produced by moving vehicles. Vertical-axis wind turbines (VAWTs) installed along highways capture vehicle-induced airflow and convert it into electrical energy to power street lighting and traffic monitoring systems. The study emphasizes sustainable energy harvesting and intelligent traffic management for smart city development.

KEYWORDS

Traffic volume study, wind energy, vertical axis wind turbine, renewable energy, smart cities.

1. INTRODUCTION

The increasing demand for electricity and the rapid growth of transportation networks have created a need for sustainable and alternative energy solutions. Vehicle-induced wind energy represents an untapped renewable resource. This research proposes the installation of micro vertical-axis wind turbines along highways to harness wind generated by moving vehicles. The generated electricity can be used to operate streetlights and traffic monitoring sensors, contributing to energy conservation and environmental sustainability.

2. LITERATURE REVIEW

D. A. Nikam (2015) studied the design and development of vertical-axis wind turbine blades and concluded that blade geometry significantly influences power generation efficiency. Dr. Boesl (2013) investigated highway wind turbines and demonstrated that a series of turbines installed along highways could generate sufficient power for public utilities such as street lighting. These studies indicate the feasibility and effectiveness of wind turbines in artificial wind environments created by vehicles.

3. METHODOLOGY

The research methodology includes the following phases:

Phase I: Field survey and traffic volume analysis on selected highways.

Phase II: Collection of data through literature review and preliminary site investigation.

Phase III: Design and optimization of vertical-axis wind turbine systems.

Phase IV: Development of a prototype model and performance evaluation.

Phase V: Validation of results using selected case studies.

4. PROPOSED SYSTEM

The proposed system integrates traffic monitoring sensors with vertical-axis wind turbines. Traffic flow data is collected using sensors and analyzed to determine optimal turbine placement. Generated power is stored using battery systems and distributed for street lighting and traffic control infrastructure.

5. EXPECTED RESULTS

The project is expected to:

- Reduce dependency on conventional energy sources.

- Generate eco-friendly electricity for highway infrastructure.

- Improve traffic management through real-time monitoring.

- Promote renewable energy awareness and smart city technologies.

6. CONCLUSION

The integration of traffic volume studies with wind-based electricity generation presents a sustainable and cost-effective solution for modern urban infrastructure. The system supports renewable energy adoption while enhancing traffic management efficiency.

7. REFERENCES

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