



# Speed Bump Power Generator

TEAM Design Term 241 - Team 57

Mohammed Al-Shehri (ME)

Mohammed Al-Sharif (ME)

Mohammed Al-Nasir (EE)

Amjad Aboras (CHE)

Suliman Al-Atawi (ISE)



## Introduction

As urban areas expand, reliance on fossil fuels for street lighting presents significant environmental and economic challenges. Our project introduces a speed bump power generator that captures kinetic energy from vehicles, converting it into electrical power. This innovative system provides a new renewable energy source, offering a sustainable and independent solution for street lighting. By reducing operational costs and greenhouse gas emissions, we enhance public safety and contribute to a cleaner, more resilient urban environment.

## Problem Statement

The existing street lighting infrastructure predominantly relies on electricity generated from fossil fuels, resulting in elevated operational costs and significant environmental degradation. This dependence renders street lighting systems susceptible to fluctuations in fuel availability and pricing. Additionally, insufficient lighting in certain areas presents safety risks for both pedestrians and drivers, compromising public safety and community well-being.

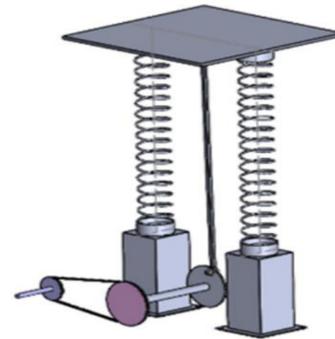
## Objective

The objective of this project is to design and implement a speed bump power generator that captures kinetic energy from vehicles traveling over speed bumps. This energy will be converted into electrical power to independently operate streetlights, thereby reducing reliance on fuel-based electricity and promoting a sustainable energy solution.

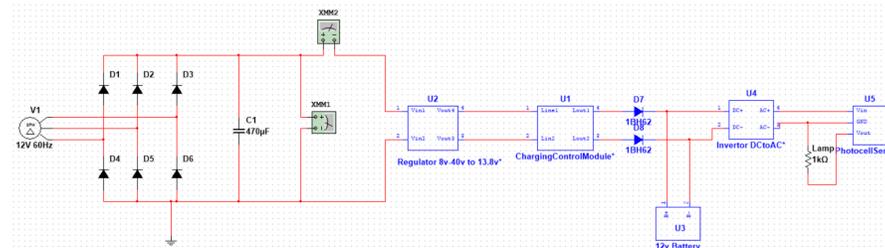
## Specifications / Constraints

Specifications	Constraints
<b>Power Output:</b> <ul style="list-style-type: none"> <li>Minimum power generation of 10 watts per stroke.</li> <li>Required 200 RPM.</li> <li>voltage output of 12V.</li> </ul>	<b>Force:</b> At least 120 N on the beam
<b>Return Time:</b> The top plate returns to its original position in under 3 seconds.	<b>Energy Generation:</b> The system must generate at least 10 watts per stroke
	<b>Space Requirements:</b> The dimensions must fit within 1200mm x 800mm x 1200mm

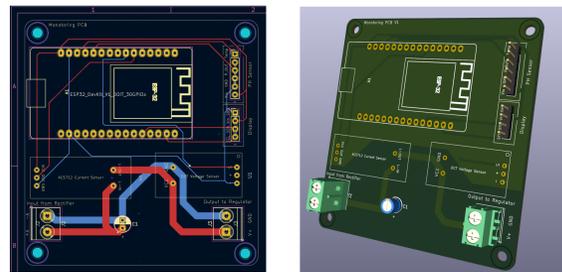
## Prototype Design Concept



## Energy Storing & Monitoring

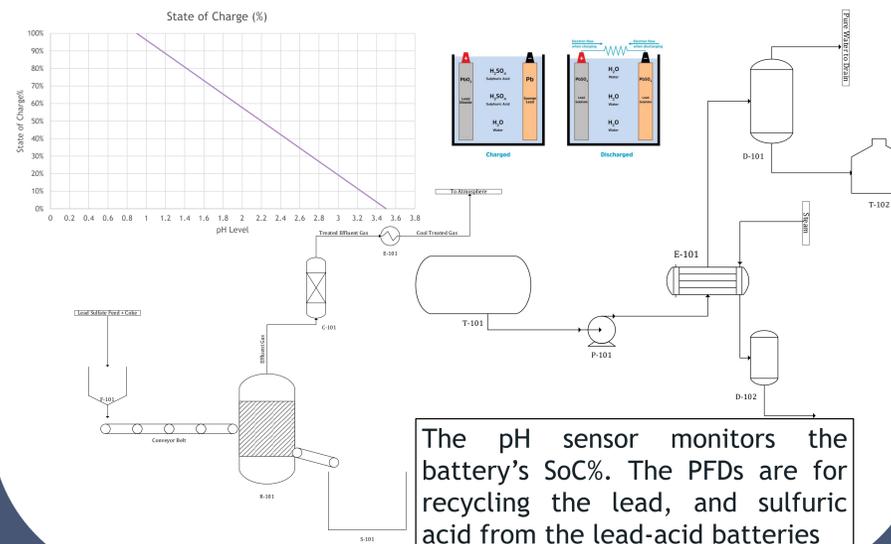


The Circuit is made of 5 stages as shown above. Rectifying Stage, Filtering Stage, Monitoring Stage, Charging Stage, and finally the Output Stage.



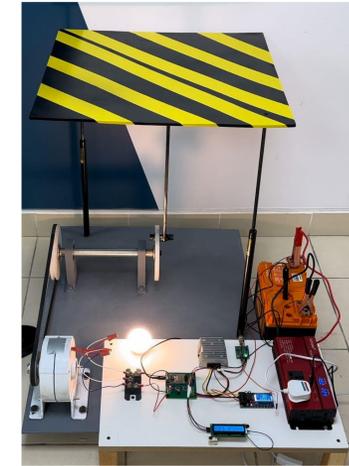
Final PCB Design

## Battery operations and Recycling



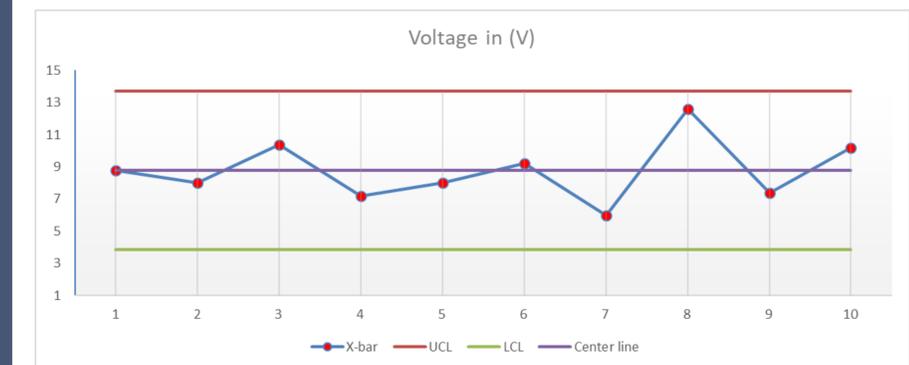
The pH sensor monitors the battery's SoC%. The PFDs are for recycling the lead, and sulfuric acid from the lead-acid batteries

## Actual Final Prototype



## VERIFICATION / VALIDATION

All testing was conducted by manually rotating the generator. The system met the power output goal, achieving 12V and 0.9A (10.8 watts). The rotational speed and return time goals were not directly measured but are expected to be met under real-world conditions. The highest recorded voltage during testing was 16V, showcasing the system's potential to exceed design expectations.



## Conclusion

The implementation of a speed bump power generator represents a significant step toward sustainable urban energy solutions. By harnessing kinetic energy from vehicles, this innovative project introduces a new renewable energy source for street lighting, reducing reliance on fossil fuels and lowering operational costs. The benefits extend beyond energy efficiency; improved street lighting enhances public safety and community well-being. As cities face growing energy demands and environmental challenges, this project highlights the potential of integrating renewable technologies into everyday infrastructure. Ultimately, it paves the way for a cleaner, safer, and more resilient urban future.