



# HARNESSING CLEAN ENERGY FROM FALLING RAINWATER DROPLETS



## DRIPVOLTS

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# Project Objectives

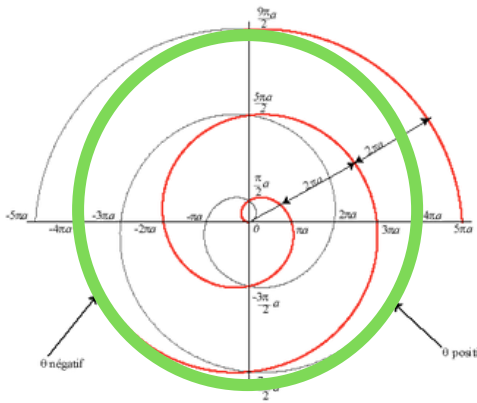
- Design a system capable of capturing the kinetic energy of raindrops.
- Integrate piezoelectric discs and electromagnetic coils to generate electricity from mechanical impact and motion.
- Develop an energy storage system using rechargeable batteries to store the harvested energy.
- Power low-voltage devices such as LED bulbs continuously using the stored energy.
- Ensure system portability and cost-effectiveness for application in both rural households and educational demonstrations.
- Contribute to sustainability goals by offering an alternative clean energy source suited to tropical, rain-heavy environments like Sri Lanka.

# Progress

Milestone	Due	Status	Remarks
• Project Title and Literature Review	April 21-May 2	100%	Completed background study on piezoelectric and electromagnetic energy harvesting.
• Proposal Submission & Presentation	May 2- May 14	100%	Successfully presented proposal. Justified hybrid energy concept using raindrops.
• System Design & Component Selection	May 14- May 20	90%	Selected pancake coil for simpler 1D implementation and higher EMF generation. Piezo configuration set to series to boost voltage.
• Simulation and evaluating	May 21-June 10	75%	Simulating piezo and EM coil response. Confirmed direct raindrops insufficient; secondary mechanism using collected rainwater in progress
• Mid- semester Progress Presentation	June 11		Will include justification for pancake coil choice, series piezo layout, and boost circuit criteria (low input voltage, high efficiency).
• Implementation & Optimization	June 12- July 15	-	-
• Final Report & Presentation	July 16-July 25	-	-
• Final Demostration	To be announced	-	-

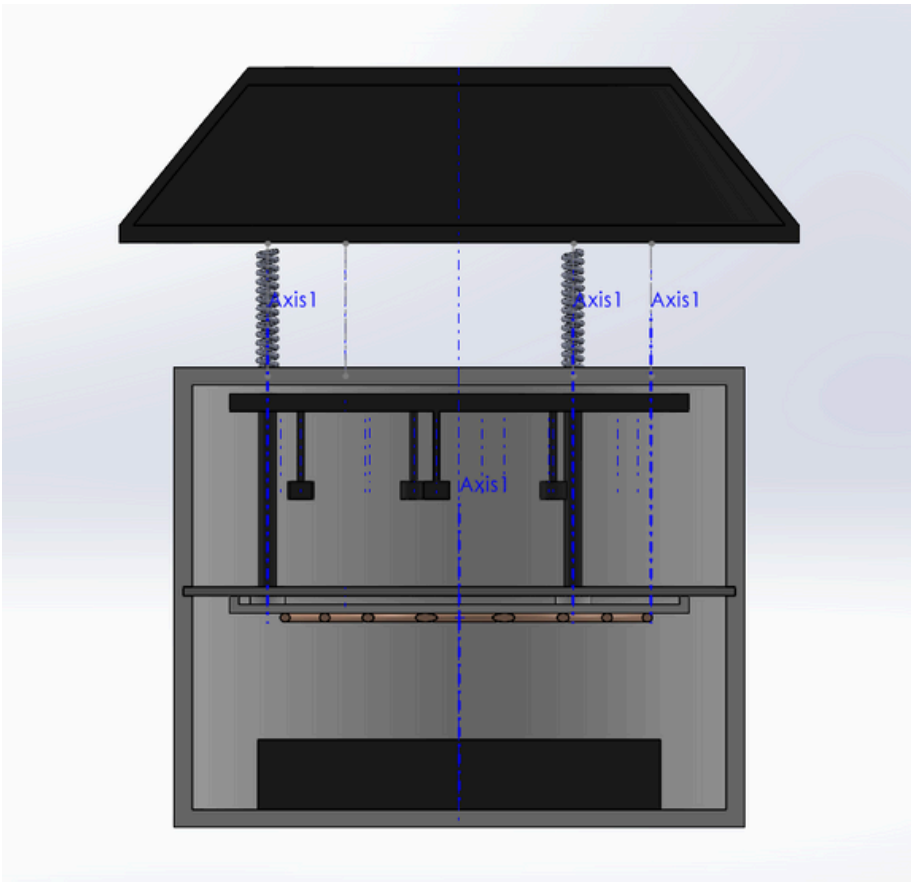


# Justification of Achieved Results

Problem	Module Divisions	Justification
<ul style="list-style-type: none"> <li>Selecting the Appropriate coil</li> </ul>	1.Solenoid coil 2.Pancake coil	<p>Both solenoid and pancake type coils have limitations in this scope. If a solenoid is used, to get the maximum EMF the coil has to have 10 of rounds and the movement and mechanism to move it will be much more complicated. Hence, a spiral pancake coil is selected with higher number of rounds and it being 1-D make the implementation effective. Also, the equation below was considered.</p> $\mathcal{E} = -N \frac{d\Phi_B}{dt} = -N \frac{d}{dt}(B \cdot A \cdot \cos \theta)$
<ul style="list-style-type: none"> <li>Analyzing pancake coil for developed EMF</li> </ul>	-	<p>By taking the mirror image of the spiral, it was able to write the area of the loop</p>  <p>La spirale d'Archimède</p>



# Justification of Achieved Results

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<ul style="list-style-type: none"><li>Direct rain drops are not sufficient for make a significant vibration in the piezo busser or electro-magnetic arrangement</li></ul>	<ol style="list-style-type: none"><li>By using large panels with series and parallel busses which directly contact with rain droplets</li><li>Via secondary mechanism</li></ol>	By practically experimenting it was noted that direct droplets will not be sufficient enough to make a vibration that could induce an EMF. Hence, the collected water of the gutter is used from drainage pipeline undergoing a mechanism which will assure the frequent movement of piezo-bussers and pancake coil are achieved.
Design methodology		<p>Considering all the factors such as,</p> <ul style="list-style-type: none"><li>stationary piezo-electric generator layer</li><li>stationary magnet</li><li>moving pancake coil and trigger pins</li><li>assuring water does not come in contact with electrical circuit</li></ul> <p>the design for the energy harvesting unit was modeled.</p>



# Justification of Achieved Results

Problem	Module Divisions	Justification
<ul style="list-style-type: none"><li>Choosing appropriate configuration of the piezo-electric generators.</li></ul>	1. Parallel 2. Series	We should connect piezo-electric generators in series in order to increase the generated current. And also, when connected in series, the generated voltage can be increased.
<ul style="list-style-type: none"><li>Choosing Appropriate boost converter circuit.</li></ul>		When choosing the boost circuit we should consider devices with a minimum input voltage and high efficiency.
<ul style="list-style-type: none"><li>Choosing the Bridge rectifier</li></ul>		We should consider a bridge rectifier with low voltage dropout .



Q&A