# Title of proposed idea/innovation

# HelioTracker: A Low-Cost, Eco-Friendly, Mechanical Sun Tracking System

**Sector:** Department of Science and Technology

**Technology: Hardware**

# Concept of the Problem

The problem is to design a non-electrical device that helps solar panels track the sun's movement to maximize energy output. The device should be:

* Cost-effective
* Environmentally friendly
* Low maintenance

Key Goals:

1. Increase energy output from solar panels
2. Reduce maintenance costs
3. Minimize environmental impact

# Brief explain newness of the innovation

The innovation of a non-electrical device for tracking the movement of the sun to increase the

efficiency of solar panels is novel and unique in several ways:

# Mechanical Sun Tracking

* The device does not rely on electricity, making it a sustainable and environmentally friendly solution.
* It uses mechanical components to track the sun's movement, which is a departure from traditional electrical and motorized systems.

# Increased Efficiency

* The device is designed to optimize the movement of solar panels to maximize energy output, leading to increased efficiency and reduced energy losses.

# Low-Cost and Low-Maintenance

* The non-electrical nature of the device makes it potentially more cost-effective and lower maintenance compared to traditional electrical tracking systems.

# Potential for Widespread Adoption

* The innovation has the potential to be widely adopted in various settings, including residential, commercial, and industrial applications, due to its simplicity and cost-effectiveness.

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# Concept & objective

* Maximize the energy output of solar panels by accurately tracking the sun's movement and adjusting the panel's orientation accordingly.
* Reduce energy losses due to inefficient panel orientation.
* Provide a sustainable and environmentally friendly solution for solar energy harvesting.
* Offer a cost-effective and low-maintenance alternative to traditional electrical tracking systems.
* Increase the adoption of solar energy as a viable and efficient source of renewable energy.

# Methodology:

# Research and Development

* Conduct thorough research on existing sun tracking systems, including electrical and mechanical systems, to identify areas for improvement and opportunities for innovation.
* Design and develop a mechanical system that can accurately track the sun's movement, using materials and components that are durable, sustainable, and cost-effective.

# Mechanical System Design

* Design a mechanical system that can adjust the orientation of solar panels in real-time, based on the sun's movement, using a combination of gears, levers, and other mechanical components.
* Optimize the mechanical system to minimize energy losses and maximize energy output.

# Prototype Development

* Develop a functional prototype of the mechanical sun tracking device, incorporating the designed mechanical system and materials.
* Test and refine the prototype to ensure accurate and reliable tracking of the sun's movement.

# Testing and Validation

* Conduct thorough testing of the prototype to validate its performance, accuracy, and reliability in various environmental conditions.
* Collect data on the device's energy output and compare it to traditional electrical tracking systems.

# Iteration and Refinement

* Refine the design and functionality of the device based on the results of testing and validation, to ensure optimal performance and efficiency.
* Iterate on the design to improve its durability, sustainability, and cost-effectiveness.

# Deployment and Maintenance

* Deploy the device in various settings, including residential, commercial, and industrial applications.
* Develop a maintenance schedule and protocol to ensure the device remains functional and efficient over its lifespan.
* The methodology is designed to ensure the development of a reliable, efficient, and cost-effective mechanical sun tracking device that can optimize the orientation of solar panels and increase their energy output.

# Outcome/ Deliverables and their Expected Impact

# Deliverables:

* Functional Prototype: A working prototype of the mechanical sun tracking device.
* Optimized Design: A refined and optimized mechanical system design.
* Testing Data: Data on the device's performance and accuracy.
* Deployment-Ready Device: A fully developed and tested device ready for use.

# Expected Impact:

* More Energy: Increase energy output of solar panels by up to 45%.
* Less Emissions: Reduce carbon emissions and promote a cleaner environment.
* Cost Savings: Reduce costs associated with traditional electrical tracking systems.
* Sustainability: Promote sustainable development and reduce environmental impact.

# Outline of the Innovative idea

* The innovative idea is a non-electrical sun tracking device that helps solar panels face the sun to increase energy output.
* Problem: Expensive and energy-intensive traditional sun tracking systems limit solar energy adoption.
* Solution: A mechanical system that tracks the sun and adjusts solar panels in real-time, without using electricity

# Key Features:

* Tracks the sun's movement
* Adjusts solar panels
* No electricity needed
* Sustainable materials
* Scalable for various use

# Benefits:

* More energy from solar panels
* Less carbon emissions
* Cost savings
* Promotes sustainable development

# Specify potential area of application in industry/market in brief

* Residential: Rooftop solar installations for individual homes
* Commercial: Office buildings, shopping centers, and other commercial properties
* Industrial: Large-scale solar farms, manufacturing facilities, and warehouses
* Agricultural: Irrigation systems, farm buildings, and rural electrification projects
* Remote Communities: Off-grid communities, rural areas, and disaster relief zones

# Briefly provide the market potential of idea/innovation

The global solar energy market is projected to reach $1.3 trillion by 2028, growing at a CAGR of 20.5%. The non-electrical sun tracking device can capture a significant share of this market, particularly in regions with high solar irradiance. With its cost-effective and sustainable solution, the device can:

* Increase adoption of solar energy in developing countries
* Enhance energy output for existing solar installations
* Open up new opportunities for off-grid and remote communities

# Technical specifications of the final deliverables: -

# Hardware:

* Solar Panel Mount
* Sun Tracking Mechanism
* Gear System
* Weather-Resistant Housing

# Performance:

* Tracks sun's movement with ± 1° accuracy
* Adjusts solar panel's angle and orientation by ± 60°
* Responds to sun's position changes in < 1 minute
* Operates between -20°C to 50°C

# Software and Integration:

* Optional IoT integration for remote monitoring
* Data analytics for energy output and system health
* API and SDK for seamless integration

# Budget for Permanent Equipment

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No | Details | . | Total |
| 1 | ****Solar Panel Mount****: | 37,500 | 37,500 |
| 2 | ****Sun Tracking Mechanism****: | 1,12,500 | 1,50,000 |
| 3 | ****Gear System****: | 75,000 | 2,25,000 |
| 4 | ****Weather-Resistant Housing****: | 60,000 | 2,85,000 |
| 5 | ****Installation and Setup****: | 75,000 | 3,60,000 |
| 6 | ****Testing and Quality Assurance****: | 37,500 | 3,97,500 |

**Business plan:**

# Market Analysis:

* Target Market: Residential and commercial solar panel users in India
* Market Size: Estimated 10 million households and 50,000 commercial establishments in India
* Growth Rate: 20% annual growth rate in the solar energy market

Competitive Advantage:

* Our non-electrical sun tracking device is more cost-effective and efficient than existing solutions

# Product Description:

* Product Name: EcoTracker
* Description: A non-electrical sun tracking device that uses a gear system and sun tracking mechanism to maximize energy output from solar panels
* Features:
* Increases energy output by up to 30%
* Reduces maintenance costs
* Environmentally friendly
* Durable and weather-resistant

# Marketing Strategy:

* Sales Channels: Online marketplaces, solar panel manufacturers, and distributors
* Pricing Strategy: Competitive pricing with a premium for the EcoTracker's unique features
* Promotion Strategy: Social media marketing, trade shows, and partnerships with solar panel manufacturers

# Financial Projections:

* Revenue: ₹50 million in the first year, growing to ₹200 million by the end of year three
* Expenses:
* Manufacturing costs: ₹20 million in the first year, growing to ₹80 million by the end of year three
* Marketing and sales expenses: ₹10 million in the first year, growing to ₹30 million by the end of year three
* Research and development expenses: ₹5 million in the first year, growing to ₹15 million by the end of year three
* Profit: ₹15 million in the first year, growing to ₹75 million by the end of year three