World of Engineering: Ideation

Team Name: Self-Solar Sweep

Team members along with their roll numbers

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Broad Problem Statement

There is a reduction in the efficiency of solar panels due to the collection of dust on their surface, mainly in western India where solar panels contribute to a large part of the energy output. Also, the manual cleaning of solar panels is very inefficient and time consuming.

Image Reference:
https://chicagoracoons.com/case-study-solar-panel-cleaning/

What is its societal importance?

- Solar power is a significant source of energy in various regions of India, especially in places that receive high amount of solar energy/km^2 throughout the year.
- The efficiency of solar panels is highly reduced if dust gets accumulated on their surface, since the amount of sunlight falling on the photovoltaic cells is significantly reduced by the dust layer.
- It is, therefore essential to have a system which cleans the solar panels as and when there is a reduction in the energy produced by the solar panels to maximise the efficiency and lifetime of the solar panels.

Why it is non-trivial and worth solving?

- This is a very prevalent problem, where researchers have proved that the efficiency of solar panels can reduce by upto 18% every month[1] just because of the dust accumulation.
- Also, in most of the households and small scale solar panels, the cleaning is done manually, which can be quite dangerous. Also, manual cleaning is laborious and time consuming.

Image Reference:
https://www.youtube.com/watch?v=D6LKiOcKr_o

Any existing solutions/Competitors?

- Enray Solar : Automatic Solar Panel Cleaning System
  - The system : https://www.youtube.com/watch?v=E-vbY3lpJmk
  - Their website is currently unreachable.
    [Link : https://www.enraysolar.com/]
  - We found sprinkler-only system on IndiaMart, which costs Rs. 20,000, significantly higher than our entire tentative cost. [Link: https://www.indiamart.com/proddetail/automatic-solar-panel-cleaning-system-26287938873.html]

What are the components that we will go into the solution?

To keep it cost effective, we have chosen the inexpensive yet durable components for this project. They are as follows (tentative components):

1) Solar Batteries as power source
2) Wipers/Rollers
3) Microcontroller board/Mechanical Counters
4) Water pump-sprayer coupled with Motor/Drippers
5) Metal frame for attaching the wipers to the lower portion of Solar Panels
6) Cable pulley system/geared rail system with motors

References

[1]Athar Hussain, Ankit Batra and Rupendra Pachauri (2017), “An experimental study on effect of dust on power loss in solar photovoltaic module” Link: https://drive.google.com/file/d/1wNOsS0AL-8PdmrGTRuI5BLYM7I3ag6TP/view?usp=share_link