

Design Concept Summary - Hayden, Jameson, Kismet

Our problem statement for the Ideation Derby is to design a device that reduces the time and labor of cleaning solar panels in the absence of rain. The proposed device, through cleaning, will increase the solar panel's efficiency.

The design criteria revolve around affordability, ease of installation, energy output, and longevity. We aim to keep the product cost under \$100 USD and ensure the installation takes no longer than 30 minutes. The energy output of the solar panel should remain a consistent source of energy, despite the cleaning apparatus. Lastly, we want to elongate the lifetime panel by 10 years.

Nigeria is hot with consistent power outages due to an unreliable power grid. Our team aims to reduce the cost of cleaning solar panels, thereby lowering the overall maintenance expenses, and making it more feasible for families to adopt solar panels. Our target users are lower to middle-class families in Nigeria, for whom affordability is paramount in making solar panels more accessible. An easy install cuts down the amount of time and labor solar panel maintenance takes, especially for working-class families. Cleaning debris will ensure a consistent source of solar energy, which is vital to a region with such an unreliable power grid. Extending the longevity of a solar panel ensures that a family can keep a solar panel for longer, essentially "stretching their dollar" and getting their money's worth out of the solar panels they originally purchased for years to come.

Our solution concept works similarly to a windshield wiper, where a rotating arm will sweep away dirt, dust, and debris. We built a physical prototype out of materials we had free access to, including cardboard, wood, metal, foam, bolts, and hot glue.

A main throughline between the solution concept, physical prototype, and problem statement is the time and labor it takes to clean residential solar panels. In our solution concept and physical prototype, we established a wiper arm that would utilize rotational motion in order to quickly sweep off debris and we entail little to no labor from the users other than the initial install.

For the solution concept developed through the ideation process, a low-fidelity prototype was created to show the connections to our design criteria, and professional, societal, and DEI considerations. To meet the needs of a simplistic product, a minimal amount of parts were used in the construction of the prototype to demonstrate that the design will be simple to install. The low amount of total parts will also help in keeping the total costs down so that our team can offer an affordable solution. The wiper arm and mounting apparatus will be relatively cheap to reproduce, cutting cleaning and maintenance costs. Our prototype is representative of a low-cost solution that would satisfy our professional consideration (financial resources) of our users. With our proposed efficiency sensor, the panel will always be producing the most energy possible since it will be wiped clean frequently, helping to aid users in receiving the full benefits of solar. This satisfies our energy output criteria. The poor infrastructure of the power grid will be compensated by the reliability of the solar panels that we will clean and ensure a consistent source of solar energy.