**Design Proposal Template:**

**School: Warren Tech Central** **State: Colorado** **Division: High School**

**Team Members' Names: Chase Allbritton, Aaron Heronemus, Blake Ferguson**

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| **Project Title:** Readers should have a general sense for what the project is about and want to read more. (20 word maximum) |
| Dust-Busters: An Affordable Air Jet System Empowering Solar Panel Owners to Maximize Renewable Energy Year-Round |
| **Inequity Being Addressed:** Describe the inequity that you will attempt to address with your proposed solution, and why you chose this inequity. Students are able to consider a global perspective related to their inequity. (75 word maximum) |
| In Colorado and beyond, low-income homeowners and small businesses often can't afford to clean their solar panels, losing up to 60% of energy output. This deepens energy inequity and limits the impact of renewable energy. Our solution is a low-cost, zero-chemical, water-free air-cleaning system that removes debris and improves solar efficiency. By lowering the barrier to solar maintenance, Dust-Busters supports UN Sustainable Development Goal #7 by making clean energy more accessible, effective, and equitable. |
| **Community Research and User Identification:** Explain the process used to identify the inequity and select your user. Include any research done to identify issues in your community and understand which groups face challenges because of these issues. (150 word maximum) |
| We began by analyzing solar adoption and environmental data across Colorado, where nearly 1 million homes use solar panels. Snowfall, dust, and pollen can reduce panel efficiency by over 60%. Professional cleaning averages $400–$600 per visit, which is unaffordable for many families. We interviewed three homeowners with solar panels who confirmed that most users clean panels only once per year, if at all. Our target users are everyday solar owners in mountain or suburban areas who need a safer, cheaper, and easier way to maintain their systems. |

**User Profile:** Provide a detailed description of your selected user. Include information about challenges they face, how those challenges impact their lives, and specific project needs based on user feedback. (150 word maximum)

Our ideal user is someone like Mark, a homeowner in Evergreen, CO who installed solar to cut electricity costs. Mark frequently struggles with snow and pollen buildup on his panels but can't afford professional cleanings or safely access his roof. He wants a system that works year-round, requires little effort, and doesn't rely on water or chemicals. Based on feedback from solar panel users we identified three key needs: affordability, hassle free installation, and remote operation. Our design addresses all of these to help users maintain their solar output and reduce energy loss independently.

**Project Goals:** List your project goals and explain how these goals will address the inequity. Project goals should define the desired outcomes, not specific features of the proposed solution. (150 word maximum)

Our goal is to reduce energy inequity by making solar panel maintenance affordable, accessible, and sustainable. We aim to increase the effectiveness of residential solar power by preventing energy loss due to snow, dust, and debris. Specifically, we want to empower users to maintain their panels without costly services, dangerous manual labor, or water waste. By enabling year-round cleaning through a self-managed, low-cost system, we support equitable access to renewable energy and contribute to UN Sustainable Development Goal #7. This project also promotes user independence, long-term energy savings, and climate resilience at the local level.

**Proposed Solution:** Describe your proposed solution, including any innovative and unique features, and explain how this solution will address your users' needs and the inequity they face. (150 word maximum)

Dust-Busters is a compact, air-powered solar panel cleaner that uses four 40mm fans with 3D-printed directional nozzles to remove dust, pollen, and light snow. The unit clamps onto the panel edge with tool-free brackets and is controlled via a mobile app or website, allowing users to activate it remotely without climbing onto their roof. Our design is unique in its modularity, affordability, and eco-friendliness: it requires no water, chemicals, or professional service. It empowers users to maintain energy output efficiently and safely, especially during winter months.

**Initial Design:** A single graphic of your first design idea with key features adequately labeled. It should be easy to understand and the reader should have a general understanding of how the prototype functions by looking at the graphic. Max size 8.5" x 11"