DRIVING CHANGE: SOLAR POWERED TRANSPORTATION PATH TO A CARBON FREE FUTURE

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BACKGROUND/CONTEXT

- The increase in greenhouse gases is causing climate change, which is having many negative consequences for our planet.
- The ground transportation sector has been a significant contributor to the increase in these greenhouse gases by burning fossil fuels. (As seen in figure 1 and 2)
- But there could be a potential solution through new emerging solar technologies.
- Therefore, these technologies from companies such as Merlin and Aptera must be used.

RESEARCH QUESTION

How will new solar technologies from Merlin Solar and Aptera positively impact the ground transportation sector’s CO2 emissions?

INTERNSHIP/METHODS

- A multifaceted research approach: Combined hands-on experience at Merlin Solar with external research.
- Merlin Solar internship insights: Invaluable experience in diverse testing conditions, understanding flexible vs. glass-encased panels.
- Testing highlights: Tests comparing Merlin Solar panels, emphasizing precision and consistent conditions. (As seen in figures 2 and 3)
- Presentation role: Created internal presentations addressing prototype issues, marketing for potential clients, and visually engaging tests.
- Aptera ambassador engagement: Over 1.5 years, actively participated, and advocated for Aptera, aligning passion seamlessly with research.

RESULTS

- Flexible Solar technology is poised to revolutionize transportation, especially for large vehicles like semi-trucks.
- Open up new possibilities, serving as a supplementary power source for essential needs like idling, technology equipment, and food temperature control.
- Lightweight, adhesive, military-grade durability for transportation applications.
- Aptera’s Solar Electric Car Advancements:
  - Aptera’s solar car provides up to 40 miles of daily charge.
  - Exceptional aerodynamic efficiency (drag coefficient of 0.13). (As seen in Figure 4)
  - Biomimicry-inspired design achieves maximum efficiency, reshaping car manufacturing norms.

Figure 1- This figure shows how large the emissions are from ground transportation. The overall transportation percentage of emissions is

Figure 2- Using a FLIR camera, I was able to find and record the hottest point of a cell during a Hotspot or shade test

Figure 3- An image of a setup for a routine hot spot or shade test, placing cardboard on half of the hottest cell and recording temperatures

Figure 4- Image of an Aptera - Solar panels can be seen over the entire car and the highly aerodynamic shape maximizes efficiency

Figure 5 - This graph shows how superior the Merlin panel is compared to a competitor panel when it comes to shade testing; this is very important because this gives a more real-world demonstration of how efficiently a panel will be on a moving vehicle dealing with shade all the time.

Figure 6- This graph shows the effectiveness of the Merlin Solar panel in Hotspot tests and Shade testing will enable trucks to reduce emissions significantly.

Broader Significance

- The effectiveness of the Merlin Solar panel in Hotspot tests and Shade testing will enable trucks to reduce emissions significantly.
- Merlin’s flexible panels for the semi-truck industry will cut down on the current emissions without needing new trucks and will bridge the gap to the final goal of net zero emissions.
- Merlin’s panels are extremely durable and therefore will be able to handle to weather of cross-country trips without losing efficiency.
- Efficient EVs and Design Innovation:
  - With exceptional aerodynamics and solar charging, Aptera’s solar car sets new efficiency standards and challenges conventional vehicle design norms.

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