TECHNICAL ASSISTANCE REQUEST

The technical assistance sought for this project will allow SuperClean Glass Inc. (SCG) to move our fully automatic self-cleaning technology from the Technology Readiness Level (TRL) 4 to 7, while advancing the Manufacturing Readiness Level (MRL) from 3 to 6. More specifically, we hope that the American-Made Network will help with testing the durability and performance of our prototype, refining our business plan, addressing manufacturing challenges, solving scale up issues and helping with technology adoption by solar industry.

Interest in solar power is increasing worldwide and with it, the demand for the photovoltaic (PV) modules that generate solar energy. PV modules are exposed to environmental temperature and humidity extremes, thereby imposing stringent performance requirements on the modules. To ensure consistent performance and safety, the modules must undergo rigorous testing to meet standards set by the International Electrotechnical Commission (IEC), Underwriters Laboratory (UL), and other organizations. This challenge needs to be addressed in partnership with SCG existing and future partners. Our current lab partner, National Renewable Energy Laboratory (NREL), will help us with durability testing and validation of our technology under realistic environmental conditions (using a laboratory-soiling chamber). This will help SCG to confirm our lab-measured dust removal efficiency under standard dust exposure conditions. Furthermore, our pilot industry partner, BMR Energy, will help us in understanding our technology performance in real work desert conditions at one of their project sites. Given a variability in test sites and dust composition, we would like to utilize the American-Made Network to conduct field-testing at different geographical locations across the United States. This will help us to develop the performance metrics in different environmental and climatic zones, thereby allowing us to tailor our design to better address such variability.

In addition to testing, we will also need to address several manufacturing challenges. Our technology is scalable and relies on industrially adopted methods, such as Chemical Vapor Deposition (CVD). The CVD technique is widely used to deposit materials for a wide range of applications. Normally the deposition rate is in the range 0.1-10 μm/hr and the temperatures are in the range 800-1200°C. We would like to get access to CVD equipment to optimize transparent conductive oxide deposition on a glass substrate at temperatures ranging from 200 to 500^{O}C. Although large-scale CVD facilities are available at our partner industrial site (Toledo Solar), we would like to conduct a smaller scale optimization of deposition condition using a small-scale CVD equipment.

Technical assistance in conducting Highly Accelerated Life Testing (HALT) is also requested. This is an important test, which should be performed during the product development cycle. The purpose of this test is to find possible flaws and ultimate design weaknesses in the product in order to avoid product failures during its commercial deployment. Highly Accelerated Stress Screening (HASS) is performed during the manufacturing processes. The purpose of this test is to improve the durability and performance of the solar panels and assist with product development. Both HALT and HASS tests need to be performed using a range of temperatures, humidity, and UV exposure levels. These accelerated tests will allow us to develop a high-quality durable glass for large-scale applications.

Finally, developing a comprehensive pathway for adoption of our technology by solar industry is a crucial aspect of our business development. Although there are analogies between adoption of solar trackers and this technology, there are also distinct differences between these

two technologies. Understanding the ecosystem of solar industry, interacting with major players in refining the value proposition, and tuning the technology development pathway based on future customers and partners feedback, will make a tremendous difference to our future.

In summary, the voucher program will help to collaborate with National Renewable Energy Laboratory (NREL) and other partners in both prototype development and field-testing, while additional technical assistance from the American-Made Network will help us to advance toward large-scale manufacturing and technology adoption. We also hope that the members of the network can help us to better understand the existing solar PV ecosystem while assisting us with business plan development and tuning our value proposition.