Low-cost, Effective Nano-Heat Sink for Solar Panel Thermal Management and LCOE Reduction

Team: Cool Tech Solar

Lead by: International Business and Technology Service Corporation (IBT)

Our team have a combination of academia researchers and industry experts, from materials scientists, engineers to solar installers to tackle this challenge with our innovative solution. To get the technology success and ready for industry implementation, we have the needs for support from national laboratories, with NREL as our primary choice. We are also looking for meaningful connectors or individual contributors who can help in one or more aspects. The details are listed as follows:

1. *Benchmark test: One of the demonstration criteria for the success of the technology is to achieve a demonstration, against conventional technology (or current baseline) and show potential LCOE reduction, i.e. peak temperature reduction, conversion efficiency (CE) improvement and projected life time change. Therefore, a benchmark test is required. Particularly, we like to be able to have a standard-independent evaluation and validation. This will drastically speed up the industry adoption speed. The desired helps are from the following:*
    - *A team of experts working with us to provide input/feedback on the benchmark test criteria. Based on our expertise, we can generate metric table for this benchmark test. With national Lab. and other industry experts, it will be great beneficial to get a consensus of the metric.*
    - *Another is to conduct benchmark test. Our team has a few different facilities that are able to complete side-by-side measurements for comparison of solar cells and panels with module size from 1-400 Watts. Therefore, we are able to complete demonstration tests as needed. It will be crucial to have an independent benchmark test team, which can verify the benefit NanoHS provided and report the metric, which will help to justify the technology benefit and to reduce the adoption barrier for manufacturers. The benchmark test will require the independent team's capability to perform solar panel efficiency measurements both at individual module level and at the full-scale module level. In addition, the solar panel surface temperature scan/mapping, with both heated panel and with external light intensity variation and air speed variation are needed in order to obtain rational response.*
    - *The independent test team needs to be able to handle 20 Watt (at the Set! Stage) and 300^{+} Watt (at the Go! Stage) panels, unless the metrics are modified according to industry feedback or DOE requirement.*

2. *Material properties characterization. Our technology involves with new materials. structures, and processes we developed for implementation. At the Set! Stage, to ensure the prototype build will meet the design target, we may need additional support for rapid materials properties measurement. This including electrical and thermal properties measurement based on the materials provided, including thermal conductivity, density and electric conductivity for NanoHS efficiency and reliability. SEM/TEM measurement of critical dimension is also needed. While our team have access of all the equipment setup, some are based on shared facilities, for the short project deliverable time required in this challenge, we like to be able to have additional support in case some of the facility access will be delayed due to unexpected reason. In addition, expertise in those measurement can also reduce the time delay to obtain correct materials properties feedback.*

3. *Advanced processes collaboration. One of the processes we will use for manufacturing will be based on either spin or spray coating. We will be very open to collaborate with manufacturers with expertise to make this process more efficient or with a lower cost. Our particular interest is to have such technology apply to large surface area with nanoscale or micro-scale adhesive, with roll-to-roll process capabilities preferred.*

4. Customer discovery and connections. We are looking for connectors that will help us to engage with manufacture companies, to be able to test and adopt out technologies as we continue demonstrate such technology. As we continue our customer discovery process, any additional contact, advice that will help us make progress during this process will be appreciated. Any additional support that can help us to establish a joint development or licensing program with existing solar manufacture will also be appreciated. We need power connectors and national laboratories to help introduce other industrial partners/customers, particularly for companies outside of the State of Minnesota.

5. We would also like to solicit input for our benchmark test, since this process will help participate participants? To understand our technology and be able to adopt it once it is demonstrated.