Provide a two-page description of the unique challenges and needs a national lab, private facility, and/or member of the American-Made Network could potentially help resolve if you win the Go! Contest. The Prize Administrator will make this request broadly available to members of the American-Made Network can understand your needs and assist you through the voucher program or otherwise.

For GO! (phase 3)

The Configurable Current Cell (C3) has unique attributes that need to be tested under a wide variety of conditions. The national lab network would provide access to needed testing equipment such highly calibrated module analysis, extended outdoor testing, rigorous shading and hotspot testing, electroluminescence as well as interaction with experts. The unique behavior of the C3 technology will need to be fully characterized by a third party lab with the ability to understand standard solar module technology and contrast the C3 technology to best differentiate the solar cell and solar module performance. The proper test setup for shading, hotspot generation, power gain, and environmental performance will need to be structured by a fellow expert in the field to ensure that results are properly measured and communicated. The equipment available at the national laboratories is too expensive for occasional use at this stage in our company's development but is also critical for market adoption simultaneously. Additionally, the expertise required to operate and maintain such equipment is an expense that is happily avoided for a new company trying to innovate new solar technologies on a limited budget.

The National Renewable Energy Lab has extensive experience in fully characterizing solar cells and solar modules under standard test conditions (STC) as well as normal operating conditions (NOC) (this includes harsh environments like heat and humidity). Sandia National Lab has extensive experience characterizing the performance of solar arrays with real time field testing as well as single module characterization. Both of these labs would help characterize our C3 technology and future technologies as well as lending world class credibility.

At present, the Configurable Current Cell (C3) has been developed, built, and tested using university partners such as Georgia Institute of Technology and the University of North Carolina Charlotte in addition to private facilities such as SBM Solar for module assembly, Sefar for print screens, and Ulbrich for interconnect wire. The use of university labs and private facilities is a significant expense item as well as a scheduling challenge. We hope to use some of the voucher prize money in the GO! Phase to help compensate Georgia Tech's UCEP lab as they upgrade their equipment to an even higher level of sophistication and accuracy (our costs to GA Tech are expected to increase rapidly throughout 2019).

The need for higher volume testing and assembly will require additional solar industry partners to aid in accelerating the development of C3 technology. We would benefit from private industry partners with the ability to fabricate solar modules with 3, 4, 5, and/or 6 bus bar technology in small volumes initially (2 - 20 modules). Later on, we will want to confirm we can scale production into the 10's and 1000's of solar modules. In addition, having strategic relationships/partnerships with private industry partners and/or national labs with the ability to help procure the needed raw materials such as silicon wafers would be helpful. In fact, the entire value chain of the solar industry is needed to fully evaluate the full benefits of the C3 technology. Installation data from field installations will provide useful real world data to confirm the laboratory findings on power and performance benefits. This real world data will help us understand how the C3 technology performs under various shading conditions over a period of weeks, months, and even years. So, to recap the needs for our technology are as follows:

Our Generation 2 Configurable Current Cell will include the additional feature of adjusting the reverse bias breakdown within a solar cell. This will require advanced lighted current-voltage (IV) measurements under various shaded and unshaded conditions to more fully characterize the added power performance and increased safety of solar panels in operation to be validated and published.

National Labs

- Access to calibration standards for a unique set of solar cells and modules
- Access to measurement equipment such as solar simulators, reverse bias testing, resistance probing, and extended real-world shading testing.
- Access to characterization equipment such as electroluminescence, photoluminescence, electron lifetime photoconductance decay, and dark current-voltage. This is essential for us to fully characterize the hotspot benefits of C3.
- Solar array real time monitoring and characterization.
- Access to environmental chambers for damp heat testing at 85^{o}C and 85% humidity.

Private Industry

- Access to raw materials such as silicon wafers, solar cells, and solar modules
- Access to consumables such silver paste, aluminum paste, copper ribbon interconnects, screen printing materials
- Access to production lines for solar cell production and solar module production.
- Access to installation partners for real world data on performance benefits for shading, hotspot generation, and power production.
- Connection with high volume solar module manufacturers such as SolarTech Universal and Silfab solar.

Collaboration and partnerships of fellow American Made companies would be a valuable asset to help accelerate the development and adoption of the C3 technology.