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Tandem PV

Capital-efficient, low-cost solar

To: California Energy Commission

Subject: Accelerating Perovskite Solar Technology Commercialization

Dear California Energy Commission,

Tandem PV (TPV) is pleased to be working on a project funded by CEC CREATE grant EPC-19-003; the project aims to drive high-efficiency perovskite tandem solar technology towards commercialization to help California ratepayers realize lower energy costs and to enable net-zero energy buildings. One year into the project, TPV has demonstrated highly efficient and stable perovskite solar modules resulting in the company securing an equity investment from a major US utility, a collaboration with a global Super League silicon solar manufacturer, a doubling of its solar workforce in California, and a plan to launch a California pilot manufacturing facility.

Tandem PV is not alone in developing perovskite PV. Multiple California-based technology teams are working on perovskites, including for example California-based perovskite tandem solar startup Swift Solar. While these teams are focusing on diverse specific materials, methods and target end products, they all face common challenges in raw materials and on-line metrology. The CEC is uniquely situated to accelerate commercialization of game-changing perovskite solar products by supporting collaborative work on these common challenges.

Much of the pro-forma bill of materials for a perovskite solar product – e.g. glass, transparent conductor coatings, wiring, protective packaging, etc. - has analogs in other solar technologies and/or in other industries. However, certain raw materials used in perovskite solar cells are not used in volume elsewhere. Perovskite solar cell quality varies from one raw material vendor to the next, within existing purity specifications, and even between material batches. This implies that specifications and/or incoming materials testing are grossly inadequate. As individual startup companies, we lack the purchasing power and resources to define industry-wide material specifications in a timely manner. With the assistance and support of the CEC, TPV and Swift Solar envision collaborating with chemical companies – e.g. California-based Spectrum Chemical and with California university chemistry groups to speed this work. Within such a project, chemistry groups would precisely identify a material's constituents, solar companies would evaluate materials for performance in solar products to determine which impurities affect solar cell performance, and chemical companies would tune materials synthesis, purification and/or handling to define specifications and tests needed for commercialization-quality perovskites.

A second common challenge to perovskite commercialization is on-line metrology. Previous generations of thin-film solar industry companies benefitted immensely from collaborating on on-line metrology; for example, x-ray fluorescence, photoluminescence and optical reflectivity were critical to controlling thin-film CIGS film quality. The development of corollary on-line metrology methods is critical to advancing perovskites to commercial manufacturing. With the assistance and support of the CEC, perovskite solar companies and California-based materials science university research groups could work together to identify common-platform metrology-performance relationships that are predictive of initial performance and long-term durability for perovskite-based solar products. Within such a project, the solar companies would process perovskite material with a range of initial performance and durability and send samples to the materials science university groups for off-line metrology analysis to establish predictive correlations. Once strongly correlated metrology is identified, online tools can be installed at solar companies to develop real-time process and tool feedback in order to increase product yield and quality – i.e. the critical benchmarks to commercialization of this new technology.

We recommend that the CEC further accelerate next-generation solar technology commercialization by investing in public-private collaborations on common challenges to bring game-changing perovskite solar technology into the marketplace and help California reach its carbon and climate goals. Thank you for your consideration.

Sincerely,

Colin Bailie
CEO, Tandem PV