ANNEX 1: ACHIEVEMENTS OF SERIS AT NUS

The Solar Energy Research Institute of Singapore (SERIS) at NUS started its operations on 1 April 2008, as Singapore's national institute for applied solar energy research. Some of its major achievements in the last decade include:

- Supported Singapore-based REC Solar in the development of its award-winning TwinPeak solar module. The panel's world-class efficiency of up to 18% makes it the world's highest-performing multicrystalline silicon solar module.

- In collaboration with leading certification bodies, SERIS offers the full range of PV module testing and certification services to the solar industry, in accordance with relevant international standards (IEC, UL).

- SERIS, together with Singapore Polytechnic and Ngee Ann Polytechnic, launched the National Solar Repository (NSR) in 2010. (www.solar-repository.sg)

- Developed the world's first all-back-contact silicon solar cell with low-cost screen-printed metallisation. The cells had efficiencies of more than 20% and the technology was successfully transferred to a company's pilot line.

- In 2013, SERIS' first spin-off company – Fosera Lighting Pte Ltd – won the "Most promising start-up in Singapore Award (category Engineering)" at the Techventure Conference in Singapore.

- Developed a 21.5% efficient n-type monocrystalline silicon solar cell that represents one of the world's best compromises between high performance and low-cost processing.

- Developed a novel surface texturing method for diamond-wire sawn multicrystalline silicon wafers. This invention paves the way for the market entry of this wafer manufacturing method which is much cheaper and cleaner than the presently used method.

- Developed "SolarEYE", an all-in-one solar cell characterisation, analysis and simulation tool based on artificial intelligence. This technology has already been licensed to two solar companies.

- Developed the world's first full-size bifacial PV module with IBC (interdigitated back contact) solar cells and showcased a prototype at the world's largest PV Expo (SNEC 2017, Shanghai, China).

- Developed bifacial PV modules for sound barrier applications in urban environments, for example along MRT tracks.

- SERIS' "hospital services" – Solar Cell Doctor, PV Module Doctor and PV System Doctor - provide a unique set of value propositions for the PV industry to improve efficiencies, optimise designs and increase energy yields.

- Jointly with Singapore's Public Utilities Board (PUB) and Economic Development Board (EDB), SERIS launched and continues to operate the world's largest Floating PV Testbed at the Tengeh reservoir in Singapore.

- Developed a proprietary and award-winning real-time monitoring system for solar PV systems, with very high reliability and availability.

- Supports the SolarNova initiative of the Singapore government, by providing technical expertise and economic viability assessments, and also through developing innovative tools for solar deployment using drone-based 3D modelling and proprietary ray-tracing algorithms.

- Trained 110 PhD students in the area of solar energy R&D and innovation, and 52 have graduated. These graduates enjoy good employment prospects in the solar energy sector, including management positions in industry and group leaders in research institutes. Some of them have founded their own start-ups in the solar energy industry.

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