

Project Title: Transformerless medium voltage central PV Inverter.

Objectives: Demonstrate single-phase operation of a downscaled MV transformerless central PV inverter with CEC efficiency > 98% and power density > 2kW/kg.

Major Milestones: Packaged 3.3 kV low inductance SiC module; MVDC experimental demonstration of single-phase operation; inverter prototype.

Significant Equipment Acquisition: 3.3kV SiC MOSFET bare dies.

Deliverables: 3.3 kV low inductance SiC Module; 200 kW transformerless central PV inverter prototype.

Projected 200kW transformerless central PV Inverter Prototype



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WBG Technology Impact

By employing WBG devices , the central PV inverters can connect directly to the medium voltage distribution system at 13.8 kV, therefore line frequency step-up transformer can be removed. The cost of high current cable, trench and switch gear can be saved. The unit power rating of center inverters can also be increased which will reduce the \$/kW. In addition, by applying 3.3 kV SiC MOSFET device and proposed technology, cost and size of passive component of central PV inverters are reduced and stability issue caused by LCL filters are avoided. Moreover, the fast dynamics enabled by WBG devices will be beneficial to implement reactive power support, ground fault and line transient protection required for central PV inverters.

More WBG Impact and Additional impacts

The developed technology will increase the US manufacture competition capability and take a lead in high voltage SiC devices as well as the fast growing utility-scale inverter market sectors including solar, wind, energy storage, MV drive, which will create more job opportunities in SiC industry and inverter industry. In addition, this project help educating graduate students and undergraduate students with WBG circuit design and system design training .

TRL level: At project start: TRL 2

Expected at project completion: TRL 4