Georgia Institute Of Technology: Tier 5-Academic Member

Georgia Tech Center for Distributed Energy

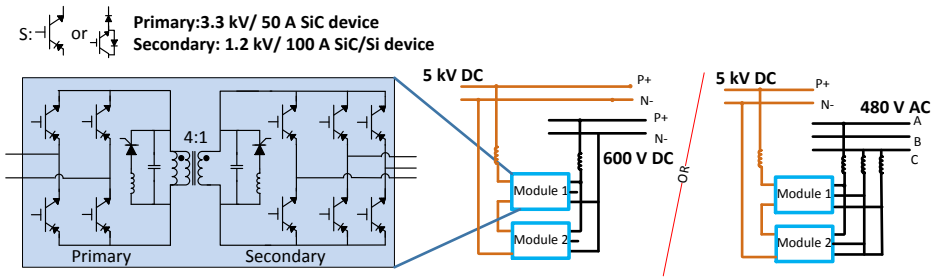
Project Title: 5 kV DC to LV DC or 3 Phase AC Microgrid Power Conditioning Modules

Objectives: Develop a MVDC to LVDC/LVAC SiC based module that can serve as the building block for a DC distribution network.

Major Milestones: 3.3 kV SiC based 2.5 kV DC to LV DC/AC module operating at 25 kW, 98 % eff, 25 kHz, and low dv/dt.

Significant Equipment Acquisition: None

Deliverables: 50 kW 5 kV DC to 480 V AC/600 V DC single stage converter with 98% efficiency , 25 kHz switching freq and low dv/dt.



Topology of the proposed MVDC to LVAC / LVDC (600 V DC) single stage four quadrant converter module.

Proposed prototype: 50 kW 5 kV DC to 480 V AC/600 V DC, Fsw = 25 kHz

SOPO Task No. BP3-4.25
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Parameter	Conventional approach	Proposed SiC-based approach
Device count	8 HV / 20 LV devices	8 HV / 12 LV devices
Loss	3 %	2 %
Fsw	500 Hz	25 kHz
dv/dt	5-10 kV/µS	1-2 kV/ µS

WBG Technology Impact

1. Compared to Si based approach the proposed solution results in reduced size and complexity through
   a) single conversion stage with high frequency isolation
   b) Low dv/dt and > 25 kHz switching freq -> small filters
2. Market segments impacted: Micro grids, distribution systems, industrial plants, naval ships and aircraft.
3. Timeframe for commercialization: 2-3 years
4. Si based approach limits Fsw to 1 kHz, resulting in large filters. Proposed SiC based approach allows Fsw > 25 kHz.

More WBG Impact and Additional impacts

1. Increase in cost per device with SiC devices is compensated by reduction in the number of devices, peripheral components and reduced filters.
2. Utilities are showing increased interest in MVDC distribution grid which can result in job creation.
3. Undergraduate students will be trained on the project and will assist in workforce development.
4. TRL at project start: TRL4.
   Expected at project completion: TRL 6, with an expectation to find commercial partner or launch a start-up who can then help taking the concept to TRL 7.