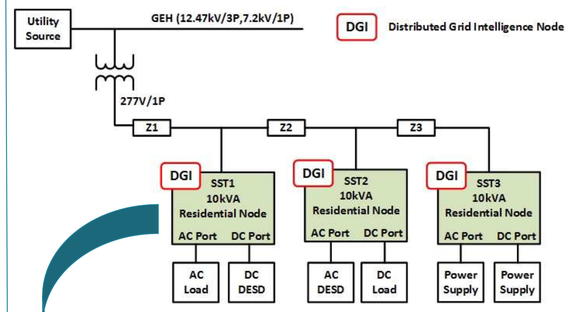
Y9.GEH1.3 Development of SiC Low Voltage SST for GEH Testbed

Dr. Radha Sree Krishna Moorthy, Siyuan Chen, M. A. Awal, Dr. Wensong Yu, Dr. Iqbal Husain

Overview

Background



277 V, 10 kVA grid interface port

380 V, 5 kW DC port

±120 V_{AC}, 5 kVA split phase port (SP1, SP2)

Objectives

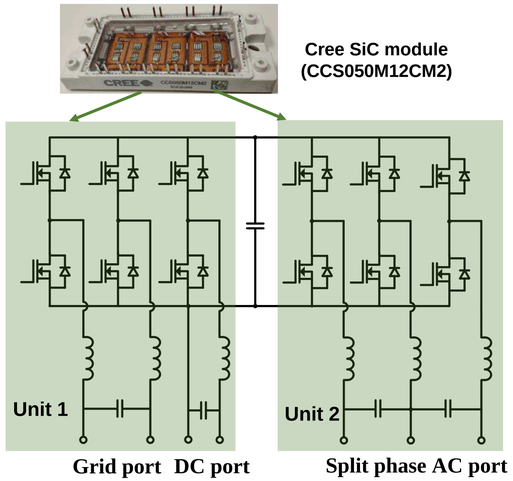
Single SST Operation

- Maintain all residential loads as long as any energy source is present, i.e. grid or DESD or DRER & isolate loads from disturbance on grid side
- Ensure smooth transition between grid-tied and islanded modes of operation
- Enable real and reactive power dispatch capability on demand from DGI

Multi-SST Operation

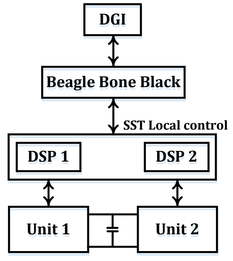
- Facilitate power sharing capability between different SSTs at off-grid condition & smooth islanding and grid connecting capability

Topology & Features

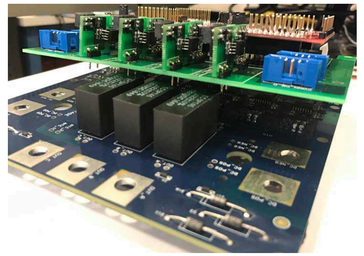


- Easily scalable and modular configuration with bidirectional power flow capability
- Each port is designed with protection circuitry for protection against internal and external faults
- Includes soft start circuit to protect the SST during power up
- Customized forced air cooling for modules & inductors
- Grid connecting/islanding switch
- Water proof enclosure

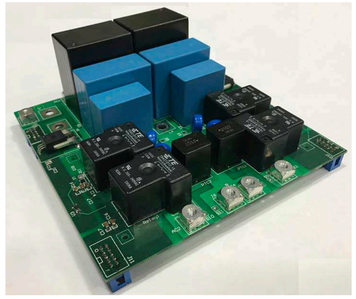
Control Hierarchy



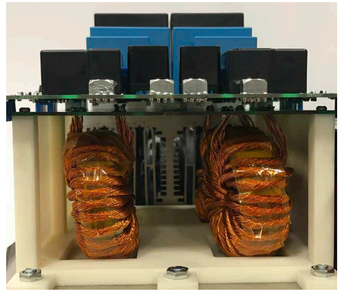
Hardware Prototype



Gate driving circuit and the interfacing board



Power stage with protection circuits

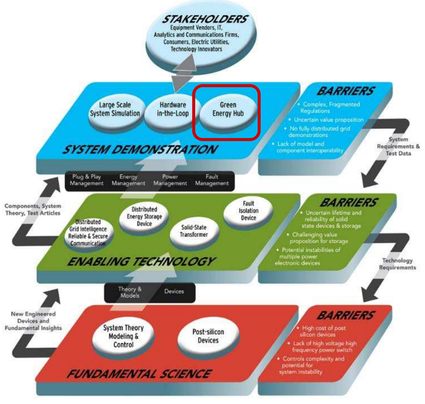


Customized inductor mounting with wind channel for forced air cooling

Integrated LVSST in an enclosure

Impacts

- Address the challenges and issues with the operation and control of multiport converters with bidirectional power flow capability at all ports
- Establishes a fully functional microgrid testbed for demonstrating grid connected and islanded modes of operation and intelligent power and energy management algorithms
- Provides a platform for testing the resilience and robustness of various control algorithms like passivity based control.



Partners

NSF