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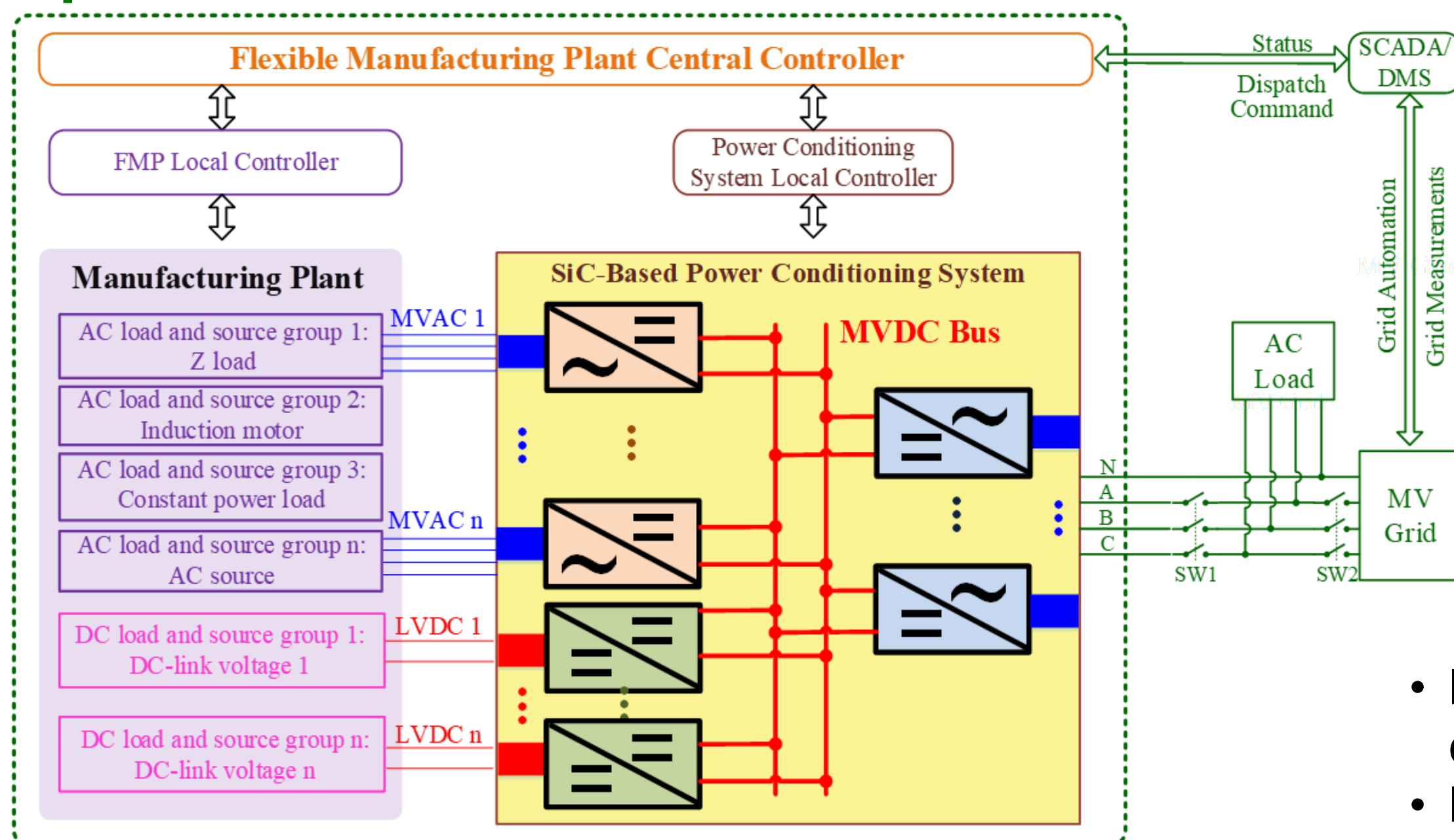
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Introduction

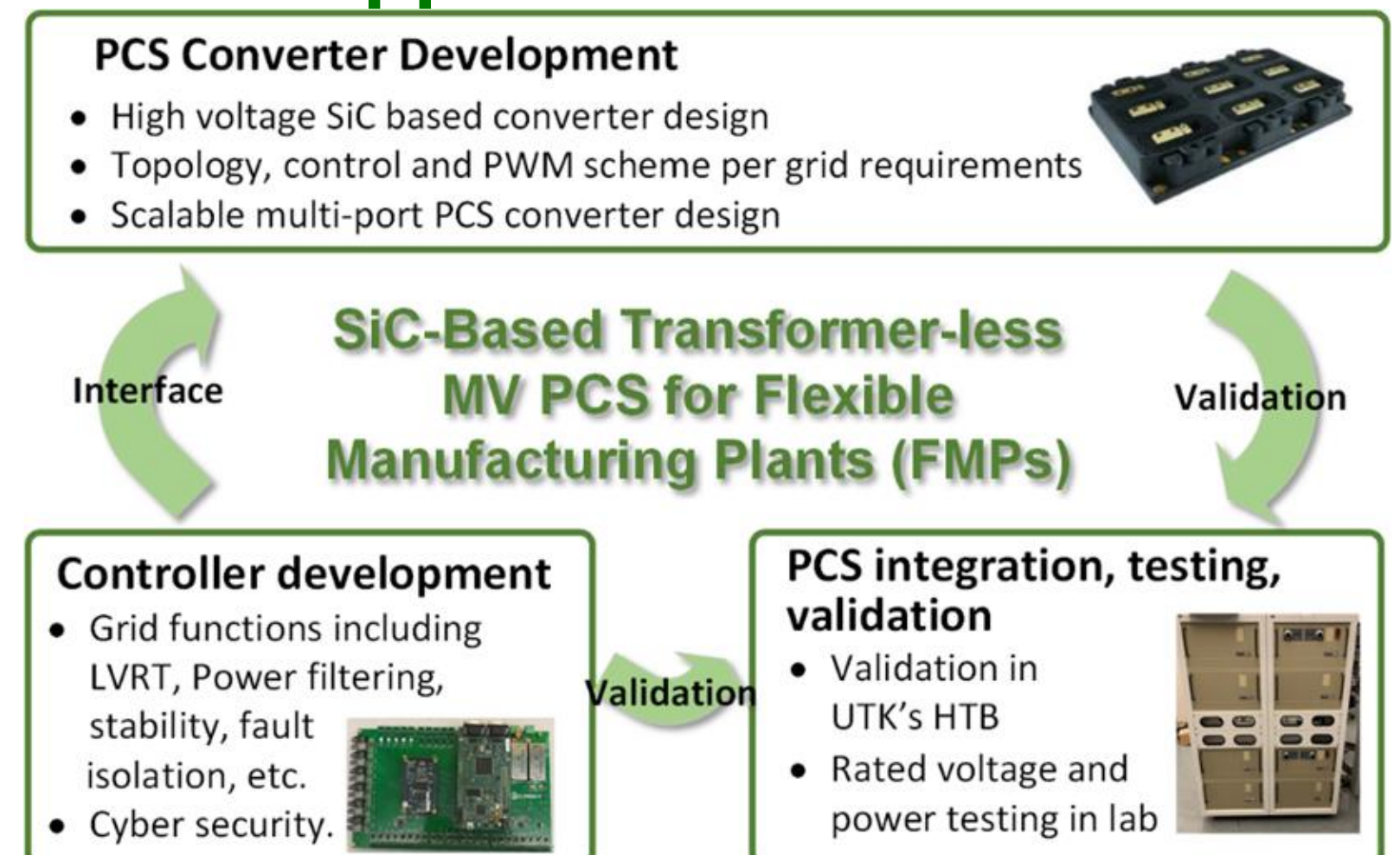
- Medium voltage power conditioning system (PCS) is a key enabler to achieve dispatchable and resilient manufacturing plants to provide support electric grid.
- A 10 kV SiC MOSFET power module based transformer-less MW-scale PCS is proposed for the flexible manufacturing plants (FMP). The proposed PCS architecture is capable of multiple asynchronous AC and DC ports, and support flexible and economic loads and source, and enables increased dispatchability and resiliency of the FMP.

Proposed PCS Architecture



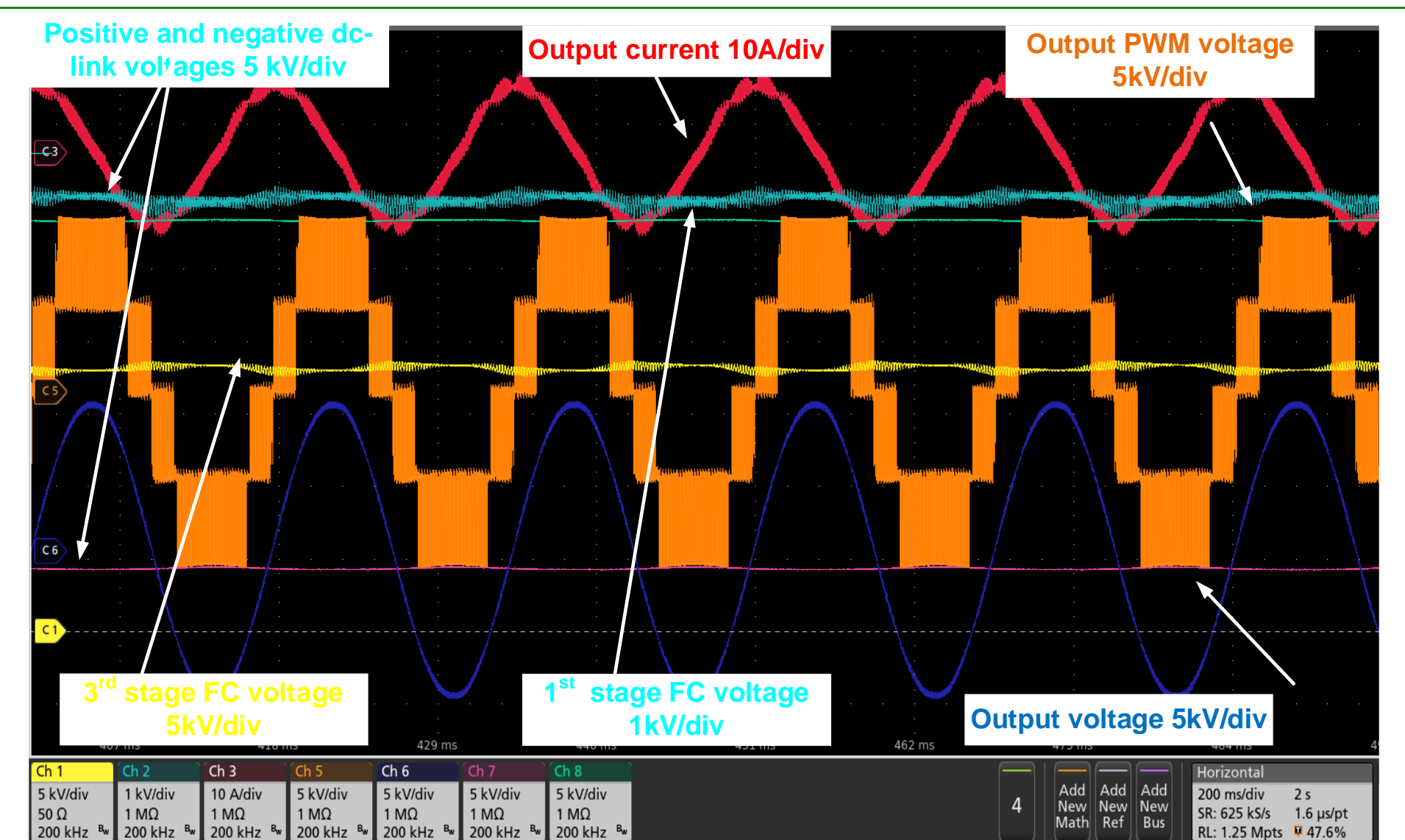
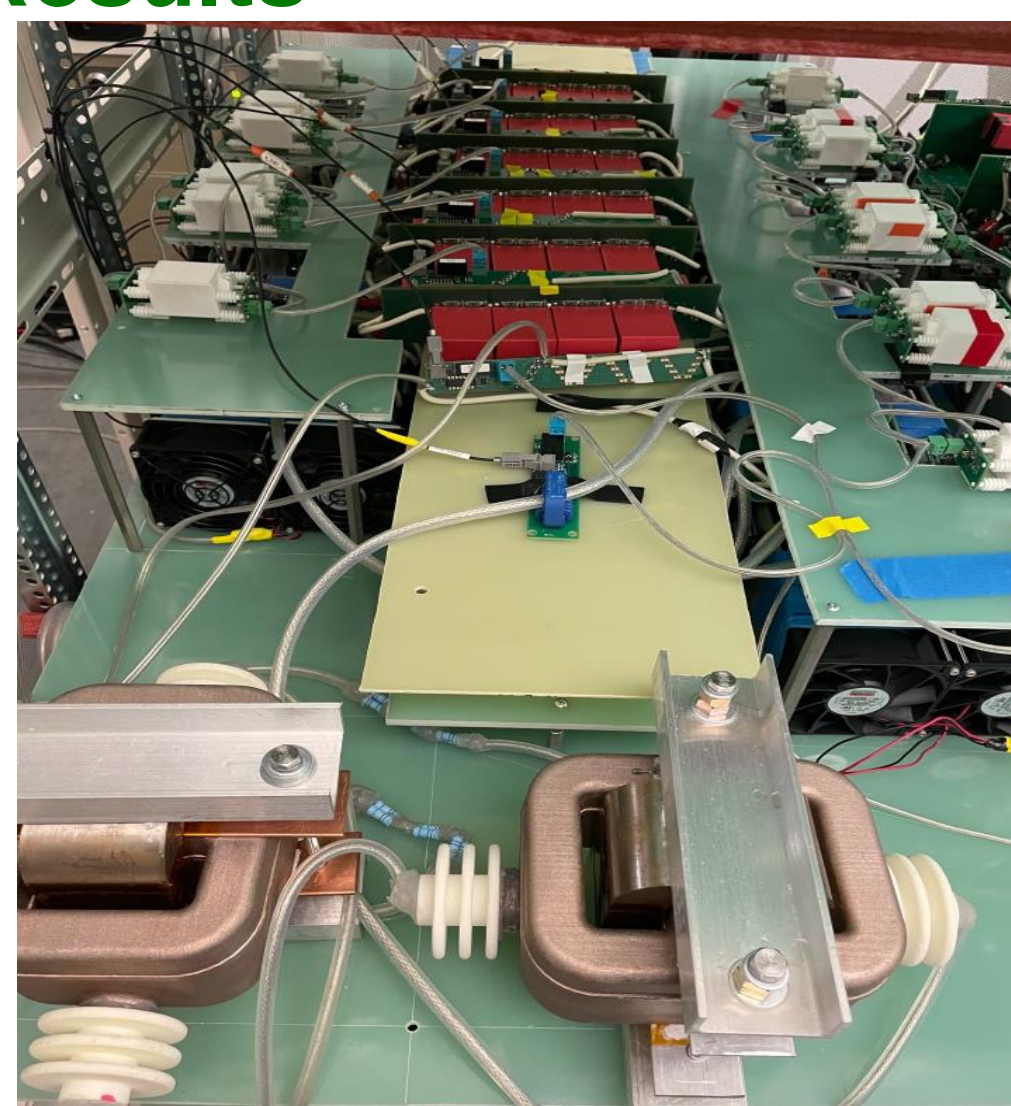
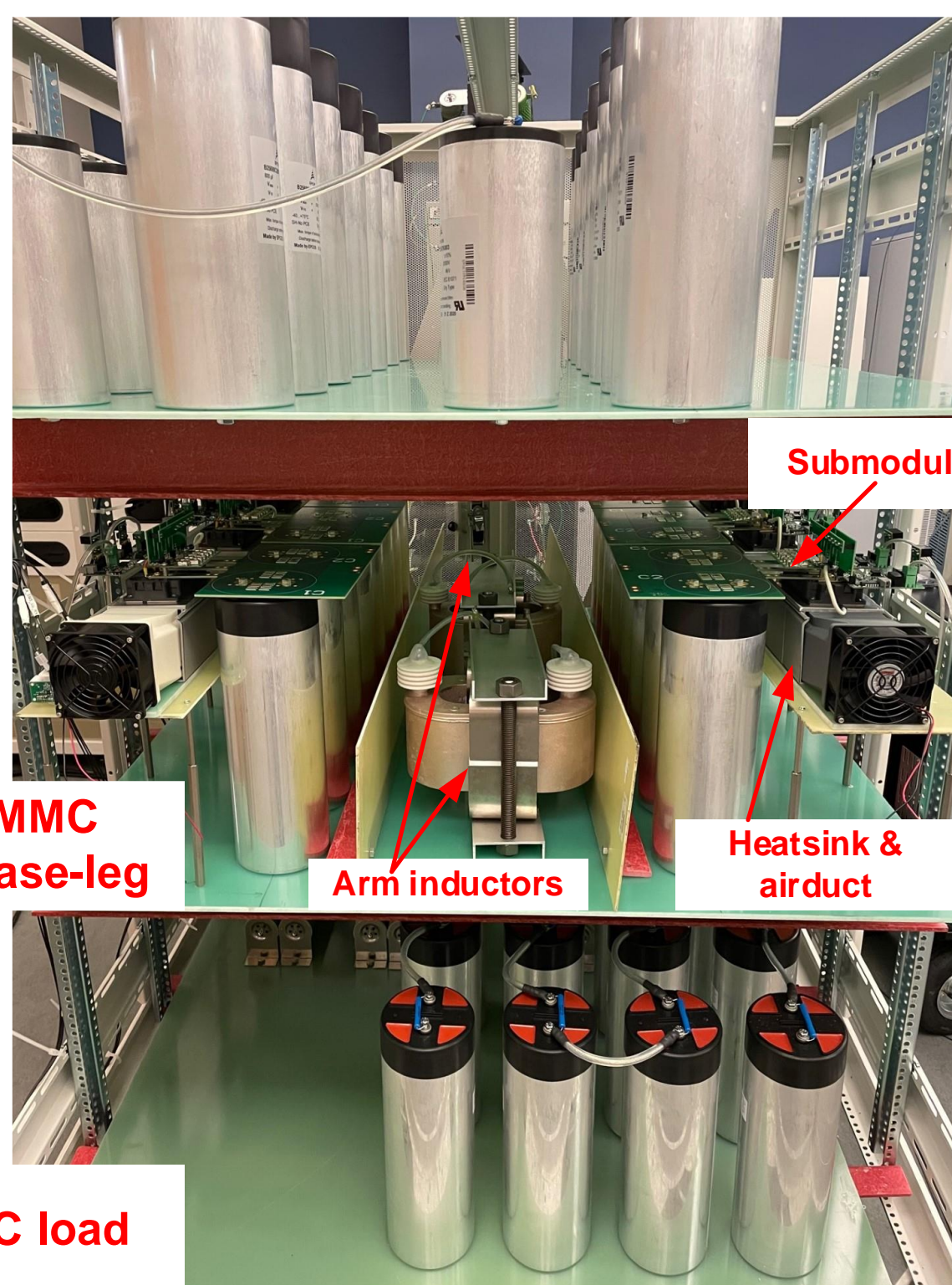
- A scalable multi-port MW-scale SiC based PCS and control for manufacturing plants to enable increased FMP dispatchability, resiliency, and grid support functions.

Technical Approaches



- BP1: Design of 1 MW AC/DC/AC converter and 200 kW DC/DC converter and FMP controller to meet all performance targets.
- BP2: Build the 1 MW AC/DC/AC converter and 200 kW DC/DC converter, and test one phase-leg of the DC/AC converter and one module of the DC/DC converter.
- BP3: Integrating and testing the PCS with FMP controller, demonstrating grid support functions.

Prototype and Experimental Results



- DC/AC converter phase-leg test waveforms conducted at 23 kV dc bus voltage



- DC/DC converter test waveforms conducted at 6.25 kV dc bus voltage

- 10 kV SiC MOSFET module based MW-level modular multilevel converter (MMC) phase-leg

- 10 kV SiC MOSFET module based MW-level flying capacitor converter (FCC) phase-leg

- 10 kV SiC MOSFET based dual active bridge (DAB) converter unit

Conclusion and Future Work

- A 10 kV SiC MOSFET based 1 MW PCS converter is designed meeting all design targets. A MW-level DC/AC converter phase-leg is built and tested. A 50 kW DC/DC converter unit is built and tested.
- Future work is to continue building and testing the 1 MW DC/AC converter and the 200 kW DC/DC converter and then integrating the PCS with FMP controller demonstrating grid support functions.

