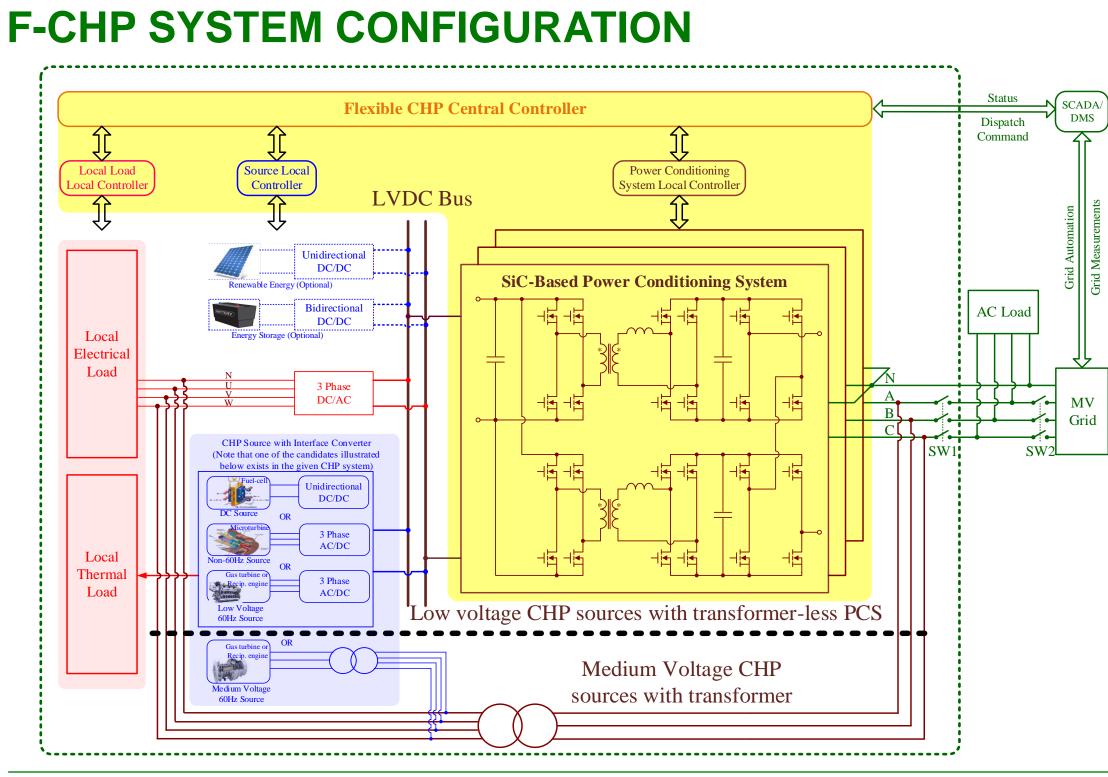


SiC-Based Modular Transformer-less MW-Scale **Power Conditioning System and Control for Flexible CHP (F-CHP) System**

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MOTIVATION & CHALLENGES

- F-CHP can help grid by providing cost-effective dispatchable generation, and flexible grid support services, and it can also benefit the F-CHP owner by receiving revenue from the grid service.
- F-CHP can integrate different types of energy sources, to reduce the cost and improve the reliability.
- Grid requirements (IEEE Std 1547 and IEEE Std 2030.7) impact on converter design need to be considered.
- Noise immunity with high dv/dt, and magnetic design considering insulation can be challenging for medium voltage converters.

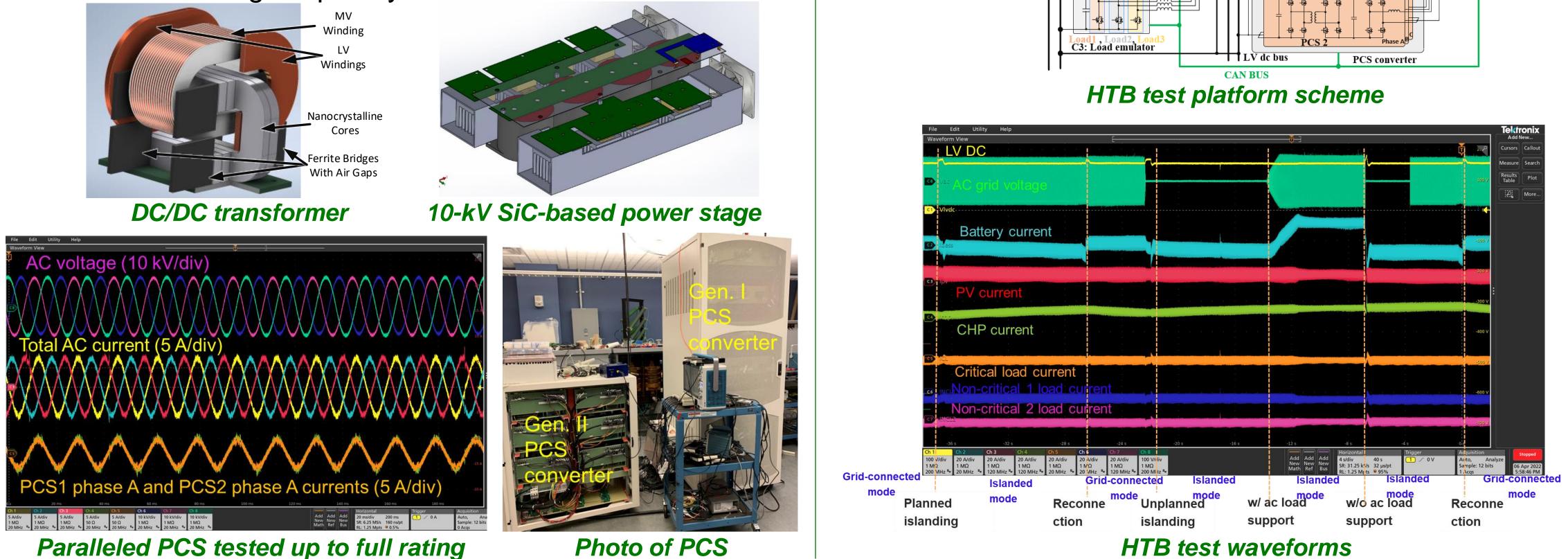


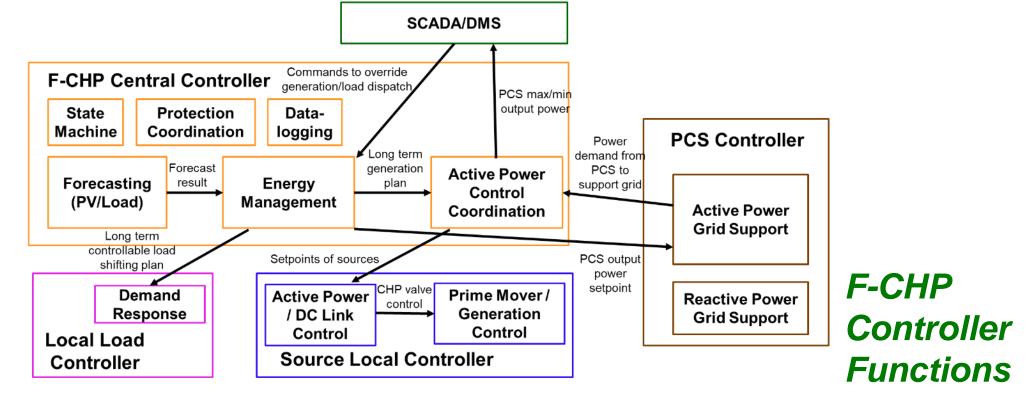
F-CHP CONTROLLER

F-CHP Controller has been designed lhe different operation considering modes and functionalities.

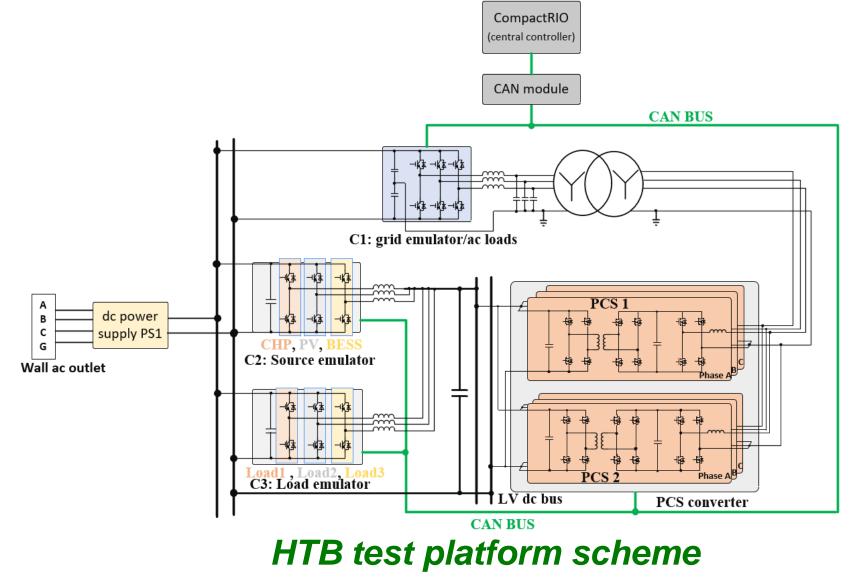
SIC-BASED PCS PROTOTYPE

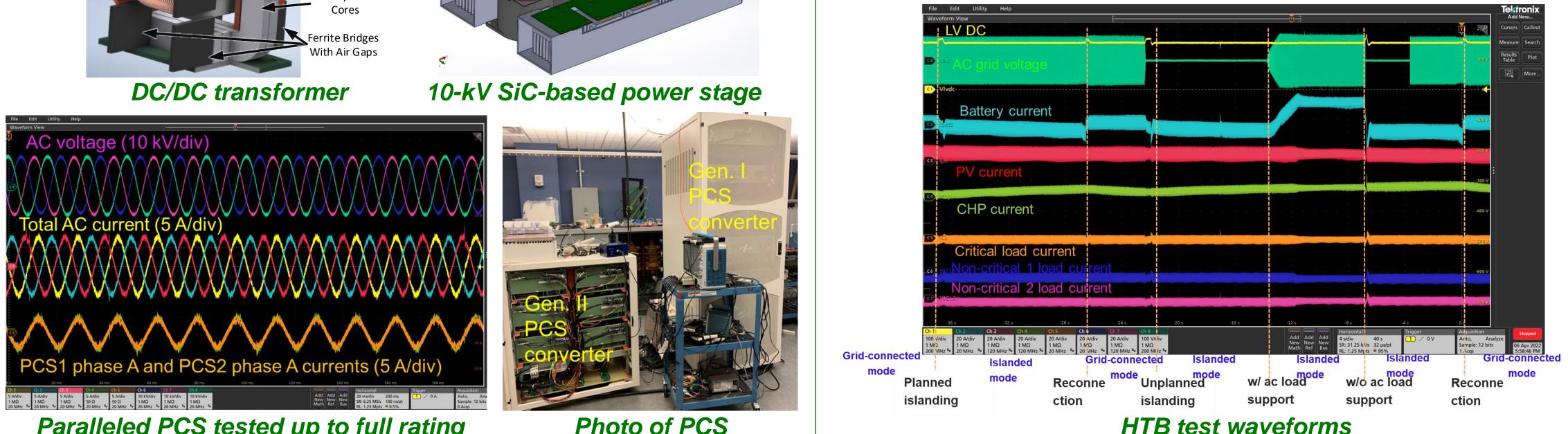
- Two 10-kV SiC-based 13.8-kV/100-kVA three-phase four-wire PCS converters have been designed, built, and fully tested under different conditions.
- Gen. II PCS achieves full load efficiency of 98.4%.
- Voltage bandwidth 300 Hz, current bandwidth 1.1 kHz with switching frequency of 10 kHz.





The controller has been tested in the hardware testbed (HTB), a converter-based testbed.





CONCLUSION

- The F-CHP controller has been designed, implemented, and tested in HIL and HTB, respectively.
- 13.8 kV/100 kW PCS converter prototype with 98.4% efficiency has been designed, built, and tested.
- PCS scalability has also been verified through the paralleling test.







