

GR-24-05: Design and Demonstration of 6.5kV SiC based Medium Voltage Shunt Active Power Filter

1. **Company or University Name**, *University of Arkansas.*

2. Project Title

GR-24-05: Design and Demonstration of 6.5kV SiC based Medium Voltage Shunt Active Power Filter (SAPF)

3. **Project PI/Contact** *Prof. Yue Zhao, yuezhao@uark.edu*

4. Technology Roadmap Target Area

- *Power Electronics Systems*
- *Distributed Energy Resources*

5. Project Summary

The Medium Voltage SAPF has undergone thorough study and demonstration, establishing its effectiveness as a technology to mitigate high levels of current harmonics waveform distortion and provide advanced grid supporting functionalities. Numerous MV SAPFs, utilizing both Silicon- and Silicon Carbide (SiC) based systems, have been developed and documented in the public domain. However, these systems face significant challenges, including increased volume due to the utilization of multi-stage architecture, presence of high harmonic currents (e.g., 17th and 19th), and the need for bulky DC link capacitors. In this work, leveraging the experience obtained from GR-22-01 and using the state-of-the-art 6.5kV SiC MOSFETs, a 13.8kV SAPF with much simplified architecture is proposed to address above challenges.

6. Technology Gap/Market Need

The MV active power filters with the need of 60 Hz transformers.

8. Target Application (where does it fit in?)

- *Distribution*
- *End Use*
- *Circuits and Converters*

9. **Accomplishments/Deliverables** *In the Year 1 of this project, the goal is to develop the 6.5-kV SiC based H-bridge cells and SAPF formed by these H-bridge cells.*

10. **Impact/Benefits** *This project directly addresses challenges and requirements outlined in Thrust 6, especially the PQ1.3 Harmonic elimination and D1.1 Power electronics interfaces that are highly efficient, low volume. Architecture studies of how these applications apply and impact the grid are needed. In this work, the proposed system will be implemented and demonstrated to improve the power quality on the full power hardware, leveraging the outcome of an externally funded effort. Through this project, the technology readiness level of the proposed MV SAPF system will be ready for field demonstration.*

11. Images

