

Addressing gaps in technology to enable large-volume WBG manufacturing

The U.S Department of Energy launched the PowerAmerica (PA) Institute under the initiative of “National Network of Manufacturing Institutes” to accelerate commercialization of SiC and GaN wide bandgap (WBG) power devices. PowerAmerica started operations in 2015 with \$140M funds over 5 years, and is managed by North Carolina State University in Raleigh, NC. PowerAmerica addresses gaps in technology to enable manufacturing that contributes to its mission of realizing manufacturing jobs creation and energy savings through accelerated large-scale adoption of WBG semiconductor devices in power electronic systems.

To achieve its goals, PowerAmerica funds strategic projects and brings together a range of companies – from startups to major corporations – as well as national labs and universities that work on every facet of the supply chain, from research and development to manufacturing and commercialization. Through membership in the PowerAmerica institute, industry members grow their business by accelerated wide bandgap product introduction to market, and University members gain by engaging in collaborative projects with industry.

Projects in the 2016-2017 funding period covered low cost WBG device fabrication, reliability, and a range of promising power electronics applications including a faster circuit breaker, a fast charger, electric vehicle traction drives, photovoltaic inverters, more efficient data centers, and heavy-duty vehicle electrification.

PowerAmerica’s largest project to date has focused on lowering the barrier to market entry for fabless SiC device companies, thereby contributing to building a stronger overall manufacturing ecosystem for this technology. The PA Institute partnered with Texas-based X-Fab to form the world’s first “open foundry” capable of supporting 6-inch SiC wafers. By leveraging mature Si fabrication practices and qualifying SiC specific processes, XFAB has enabled high-yield volume manufacturing at the economy scale of silicon. This capability enables fabless semiconductor companies to economically fabricate silicon carbide devices and compete in new ways. The conversion of an existing silicon factory into one capable of additionally fabricating SiC has produced significant benefits for the SiC ecosystem. In addition to facilitating volume manufacturing, PA is accelerating WBG adoption by training the workforce through short course offerings and tutorials, and by preparing the next generation of high-skilled WBG technologists through hands-on projects at leading US Universities.

The presentation will outline models for low cost SiC manufacturing in the US, and describe select projects that exemplify the performance advantages of SiC and GaN based power electronic systems.