



Program: PowerAmerica

Release Date: August 7, 2017

Deadline for Responses: August 28, 2017, 5:00PM EST

Submission Method: Responses should be submitted at:

<https://www.poweramericainstitute.org/request-for-information/>

Objective:

PowerAmerica seeks public input on applied research topics addressing gaps in knowledge and technology to enable manufacturing that will contribute to its mission of realizing energy savings and creating manufacturing jobs through accelerated large-scale adoption of wide bandgap semiconductor devices in power electronic systems. The information collected through this process will assist PowerAmerica in developing its **Funding Period 4 request for proposal (RFP), which has an expected publication date of SEPTEMBER 2017. Successful projects from the RFP will be included in Funding Period 4 of the PowerAmerica award with the Department of Energy (DOE), which is expected to begin on July 1, 2018 and last through June 30, 2019.**

Background and Rationale:

The U.S Department of Energy (DoE) launched the PowerAmerica Institute under the National Network of Manufacturing Institutes (NNMI) initiative to accelerate adoption of wide bandgap power devices. The Institute is managed by North Carolina State University. PowerAmerica is accelerating the adoption of advanced semiconductor components made with silicon carbide (SiC) and gallium nitride (GaN) into a wide range of products and systems. Backed by \$70 million from the U.S. Department of Energy over five years, PowerAmerica is working to make these wide bandgap semiconductor technologies cost-competitive with silicon-based power electronics and reduce their perceived risk in industrial applications.

PowerAmerica brings many of the world's leading wide bandgap semiconductor manufacturers and end-users together with experts from top research universities and government agencies to accomplish its objectives. Through participation in the PowerAmerica ecosystem, industry members grow their business by accelerated wide bandgap product introduction to market, and University members gain by engaging in collaborative projects with industry.

In addition to soliciting information from its numerous members that span all areas of wide bandgap semiconductor device and power electronic systems, PowerAmerica strongly encourages responses from industry/universities with technical activities highly relevant to the PowerAmerica mission who have not yet joined the PowerAmerica ecosystem.

In the RFI guidelines and topics that follow, PowerAmerica has outlined objectives formulated through internal planning and through informal discussions with stakeholders.

PowerAmerica expects to expand and revise its plans for the upcoming Funding Period 4 RFP by incorporating feedback from responses to this RFI.

RFI Guidelines:

Parties interested in responding to this RFI should first review the PowerAmerica program areas of interest described in this document, as well as the guidelines presented below in their entirety. Respondents may address multiple program areas, however, each topic should be fully addressed in a separate response.

Responses should provide a presentation of the proposed topic including a description of the current scale of technology deployment and the required improvements in technology performance, manufacturability, and/or supply chain integration needed for widespread adoption. Responses should also be supported by industrial and technical data, include a discussion of key technology barriers and challenges that need to be overcome, and provide an estimate of the scale of the resources and timeframe that will be needed to enable widespread adoption by industry. Justification for how the proposed topic strongly supports the PowerAmerica mission of realizing energy savings and manufacturing jobs creation through accelerated large-scale adoption of wide bandgap semiconductor devices in power electronic systems (www.poweramericainstitute.org) should also be provided.

This is not a Request for Proposals (RFP). PowerAmerica will not pay for information provided through this RFI. PowerAmerica is NOT seeking specific proposals with this RFI, but is interested in soliciting broader perspectives on mission related areas that would benefit from focused development activities. Responses to this notice are not offers and cannot be accepted by PowerAmerica to form a binding contract. Respondents are asked to focus their responses on highlighting promising areas and topics that will benefit from development and will have a strong lasting impact in advancing the PowerAmerica mission.

Comments in response to this RFI must be submitted to PowerAmerica at <https://www.poweramericainstitute.org/request-for-information/>. To be considered, comments must be provided no later than 5 pm EST on **August 28, 2017**. All documents responding to this RFI must be delivered electronically to the web address above using either Microsoft Word (.doc) or Adobe Acrobat (.pdf) formats and with a file size no greater than 3 MB. Power Point files (.ppt) converted to Adobe Acrobat (.pdf) files will also be accepted. **Responses must be less than 3 pages or slides in length.** Responses that do not meet these criteria will not be considered.

Information obtained as a result of this RFI will be used by PowerAmerica for program planning on a non-attribution basis. Information with limitations or restrictions on its use is not solicited and will not be considered. **Do not include any information that might be considered proprietary and/or confidential.** There will be no specific response to submissions other than acknowledgement of their receipt. This PowerAmerica RFI is seeking from the public, broader non-proprietary perspectives on mission related areas that would benefit from focused research and development activity, and any resulting program activities will be developed internally by PowerAmerica. Submission of responses to this RFI will not preclude a respondent's participation in future PowerAmerica programs addressed by responses to this RFI.

Program Areas of Interest:

PowerAmerica is not seeking to support development of materials, development of wide bandgap semiconductor technology areas which have not yet demonstrated technical feasibility, or in developing fabrication approaches for technologies that have already been demonstrated to be suitable for high-volume manufacturing. PowerAmerica is specifically interested in supporting topics that will strategically impact its mission of realizing energy savings and manufacturing jobs creation through accelerated large-scale adoption of wide bandgap semiconductor devices in power electronic systems. PowerAmerica believes that the challenge of accelerated large-scale adoption of wide bandgap semiconductor devices will require a multidisciplinary approach and encourages the participation of well-established large companies, small companies, start-up companies, national labs, and universities. PowerAmerica will consider supporting topics in all areas relevant to its mission. Several high-impact topics in each area in which PowerAmerica is considering investing are listed below in order to stimulate respondent input. By no means is this to be considered an exhaustive or definitive list of PowerAmerica topics of interest.

Focus Area 1 – Management and Operations

Comments not solicited.

Focus Area 2 – Foundry and Device Development:

Address the knowledge gaps in WBG device manufacturing that will enable industry to increase scale of production, continue to reduce cost, and expand high volume manufacturing to higher-voltage and higher-frequency devices. Foundry and device development activities include the following and others identified by this RFI:

- US Gallium-Nitride Merchant (Open) Foundry Infrastructure Development that leverages existing high-volume 150 mm or 200 mm silicon or GaN RF device fabrication to address knowledge gaps that prevent high-volume manufacturing of GaN power devices.
- US Silicon Carbide Merchant (Open) Foundry Infrastructure Development that leverages existing high-volume 150 mm or 200 mm silicon device fabrication to address knowledge gaps preventing high-volume manufacturing of SiC power devices.
- GaN Power Devices and Process Integration into a GaN foundry that enables high-volume manufacturing in the US.
- SiC Power Devices and Process Integration into a SiC foundry that enables high-volume manufacturing in the US.

Focus Area 3 – Packaging and Power Electronics Assembly Integration, Test & Reliability:

Address the knowledge gaps in integrating advanced WBG power semiconductor devices into discrete and module packages, integrating these modules and packages into power electronic circuit-boards and bus-bar assemblies, and performing testing, reliability, and failure analysis of WBG devices. Assembly and test activities include the following and others identified by this RFI:

- SiC power device module package, bus-bar or circuit-board, and gate-drive research that will enable industry to develop and manufacture products using SiC devices.
- GaN power device high-frequency package, circuit-board, or power integrated circuit, and gate-drive research that will enable industry to develop and manufacture products using GaN devices.
- Reliability, testing, and failure analysis methods that will enable industry to commercialize SiC devices.
- Reliability, testing, and failure analysis methods that will enable industry to commercialize GaN devices.

Focus Area 4 – Wide Bandgap Semiconductor Power Electronic Application Integration:

Address the knowledge gaps in supply chain integration that will enable WBG power devices to have a transformative impact in the following critically important applications and others identified by this RFI:

- Transportation (Electric and hybrid vehicles, rail traction, heavy duty electric and hybrid vehicles, vehicle chargers, on board chargers, more electric aircraft, electric ship, space, etc.)
- Renewable and Clean Energy grid integration (Photovoltaics, wind applications, grid-tied energy storage, Natural Gas Combined-Heat-and-Power etc.)
- Power delivery grids and Microgrids (DC or AC), and their integration with suitable stability, power quality, fault protection, and resilient uninterrupted power
- Industrial motor drives and HVAC
- Enterprise equipment, data center/telecom (48V front-end AC/DC, PoL DC/DC, etc.), power supplies
- Consumer power supplies (home appliances, laptop adapters, chargers, LED drivers, Class D audio amplifiers, etc.)
- Wireless power (mobile chargers, EV/HEV chargers, medical device chargers, etc.)
- High power medical equipment
- Industrial cooking, heating, and welding

Focus Area 5 – Education and Workforce Development:

Address gaps in workforce education to meet the rapid transition from silicon-based power electronics to WBG-based power electronics, and to expand power electronics systems to the new transformative higher-voltage and higher-frequency applications enabled by WBG technology. Education topics focus on upper-level undergraduate students and graduate students working in WBG power electronics, and may also include workforce development for professionals and practitioners through continuing education. EWD activities include the following and others identified by this RFI:

- Course and laboratory curriculum development, textbooks, instructional material development etc. Leveraging, expanding, and adding power WBG content to existing power electronics education programs will be considered.
- Innovative outreach to other educational areas to build the ecosystem needed to quantify and leverage the transformative potential of WBG power electronics. For example, partnerships with business schools to conduct impact studies of WBG applications or ideas for other similar partnerships are sought.
- Exposing upper-level undergraduate students to WBG power electronics professional activities and internships that inspire them to seek graduate education and career opportunities in WBG power electronics areas.
- Workforce development for professionals and practitioners through continuing education. Materials to be developed include technical seminars, extended tutorials, short courses with hands-on laboratory or manufacturing experience, application notes, reference design documentation, and online professional training programs.

Closing Comments

PowerAmerica welcomes public input through response to this RFI and looks forward to working with the wide bandgap semiconductor community to design a highly relevant, high-impact Funding Period 4 program that strongly supports the PowerAmerica mission of realizing energy savings and manufacturing jobs creation through accelerated large-scale adoption of wide bandgap semiconductor devices in power electronic systems. PowerAmerica thanks you for providing your valuable input in response to this RFI.