

Request for Member Initiated Project Proposals Round #2

Approved at the May 29, 2019 MAC Meeting

The PowerAmerica Member Initiated Projects (MIP) program is a valuable benefit of the Institute that is focused on critical needs of the WBG community. The specific purpose of establishing MIP is to provide a mechanism for Institute members to collectively identify the priority projects that are needed to advance WBG commercialization and to direct resources to address those challenges. As the name implies, these projects will be funded by member dues and other revenue generating activities the Institute may perform (without DOE funds).

This request for proposals is issued to PowerAmerica members as a result of action taken by the Member Advisory Committee (MAC) on May 29, 2019. The MAC approved four topics for the purpose of soliciting proposals according to each topic. Topics are described in Appendix A.

Any member may respond to any topic individually or as part of a team. Guidelines specifying the form of each proposal and information about how proposals will be evaluated are described in Appendix B. Project proposals should anticipate work that can be completed within one year. If you plan to submit more than one proposal, or participate on more than one team, please contact Jim LeMunyon at PowerAmerica, 919-513-3849 or Jim_LeMunyon@ncsu.edu.

Proposals will be reviewed by a committee of PowerAmerica members who are not participating on any proposal team, formally or informally as an advisor, who will make project funding recommendations to the MAC.

It is anticipated that three or four proposals will be selected with funding from PowerAmerica, with up to \$200,000 per funded project. Although not required, a cost match in addition to PowerAmerica's funding is encouraged and will be taken into account when scoring proposals.

Questions should be directed to Jim LeMunyon at PowerAmerica, 919-513-3849 or Jim_LeMunyon@ncsu.edu.

Round #2 Topics for Member Initiated Projects

PowerAmerica recently updated its technology roadmap and at the Annual Meeting in February 2019 solicited comments on the roadmap's SiC and GaN technology and applications challenges that could be addressed.

A working group of members was established to evaluate the comments on the roadmap for the purpose of facilitating the development of new Member Initiated Projects (MIP). The working group solicited additional information from PowerAmerica members about possible project topics during March and April 2019 and recommends the following three topics and an "open" topic. The first three topics include highlights of members' comments received. These highlights are not intended to specify project requirements, but instead indicate issues of interest to PowerAmerica members. A complete set of member comments is available upon request from PowerAmerica's staff.

a. Improve device packaging to take better advantage of SiC and/or GaN device performance including packaging for 200A+ and better package footprints.

Specific interests noted by PowerAmerica members include but are not limited to (see the more complete list of PA member comments):

- New materials with small thermal conductivities;
- Top cooled devices with the cooling surface electrically isolated;
- Packaging that leads improved layout for gate driver including minimization of inductive loops in driver circuitry; and
- High temperature performance with junction $T \geq 225^{\circ}\text{C}$.

b. Improve SiC and/or GaN module packaging and reliability, including the study of failure mechanisms, robustness and qualification requirements for aerospace, vehicle electrification and other applications.

Specific interests noted by PowerAmerica members include but are not limited to (see the more complete list of PA member comments):

- Scalable HV packaging concept that could be applied to create a new WBG focused "family" of power modules operating at $> 3.3\text{kV}$ and $> 100\text{A}$;
- Thermal cycling capability/reliability that addresses CTE mismatch including identifying new materials for use in power modules or demonstrate ways to mitigate CTE mismatch;

- Flexible module designs, 3 level T-type designs and NPC designs;
- Low parasitic inductance package;
- Maximum junction T \geq 225C; and
- Module reliability that meets established standards for silicon-base modules.

c. Improve SiC and/or GaN device design and techniques including monolithic integrated gate driver designs.

Specific interests noted by PowerAmerica members include but are not limited to (see the more complete list of PA member comments):

- Compact, monolithic/integrated, smart gate drivers that can have device health monitoring capability;
- Interface between gate drive and module with low loop inductance;
- Low cost technology to integrate drivers with FETs, especially for half-bridges;
- High performance variants of IPMs traditionally used for Si; and
- Gate driver circuit configurations that achieve best results for paralleling devices to achieve a larger current rating

d. Additional project topics not specified in a-c but meet the needs identified in the PowerAmerica Technology Roadmap.

Member Initiated Project Guidelines Round #2

Project Proposals

- a. Projects should be pre-competitive in nature, the results of which should benefit members broadly without the expectation of intellectual property creation. Project output and results will be shared with all members.
- b. Projects can be up to 12 months in length.
- c. One large project or several different, smaller projects may be developed to be performed in parallel.
- d. Cost match is encouraged but not required.
- e. Projects can be proposed and carried out by any member in good standing.
- f. Although pre-competitive in nature, it is expected that project will contribute to the PA mission of realizing manufacturing jobs creation and energy savings through accelerated large-scale adoption of WBG semiconductor devices in power electronics systems, consistent with PowerAmerica's SiC or GaN technology roadmaps.
- g. Collaboration between members is encouraged, either formally with compensation or as informal advisors on the project. All participants, formal or informal, must be named in the proposal.
- h. No MIP funds can be provided to or used by non-members (except for materials, supplies, justified contracted services, etc.)
- i. The award of an MIP will not affect any member's project activity or funding through PowerAmerica's Call for Projects or Open Innovation Fund.
- j. All proposers must certify as part of their proposal that they have read and understand the provisions of PowerAmerica's Bylaws (revised April 23, 2019) that apply to MIP, including the intellectual property provisions of the Bylaws. In addition, any background intellectual property that may be used in the project must be identified and described in the proposal.

Proposal Review Process

1. A MIP Working Group of the Member Advisory Committee will review, score, and recommend projects to the Member Advisory Committee for funding.
2. PowerAmerica will post announcements related to MIP project solicitation, selection and funding through its Web-based InfoReady application.
3. Expertise from outside the MIP Working Group may be employed as needed as part of the review.
4. Criteria that will be used in evaluating and scoring proposals are:

- a. Significance: The extent to which the project, if successfully carried out, will make an important and/or original contribution to the field of endeavor. The project should be pre-competitive in nature but advance the state of the art and broadly benefit the membership and a range of applications. Incremental advances are not of interest. (35% weight)
 - b. Approach: The extent to which the concept, design, methods, analyses, and technologies are properly developed, well-integrated, and appropriate to the aims of the project, and result in an outcome that is in the range of TRL 4-6. Evidence of scalability and potential manufacturing will also be considered. (35% weight)
 - c. Feasibility: The likelihood that the proposed work can be accomplished within the proposed budget and within one year timeframe by the investigators and technical staff, given their expertise, past performance and results specific to the technology that is the focus of the project, available resources, institutional/organizational commitment, and (if appropriate) access to technologies. The level of cost match will be taken into account. (20% weight)
 - d. Time to implementation: The speed with which the project output can be put into commercial practice. (5% weight)
 - e. Impact on US manufacturing: Job creation, economic impact, or education and workforce development impact. (5% weight)
5. Once proposals are selected for an award, subsequent meetings may be organized with the MIP Working Group to shape and refine the project plans. The MIP Working Group has the latitude to negotiate with the proposers to modify projects or negotiate the combination of similar proposals received from more than one entity.
 6. PowerAmerica will issue the award to the project recipient(s).
 7. Project reporting will be quarterly, plus a final report, submitted to the full Member Advisory Committee.

Proposal Preparation -- General Provisions

- No proprietary information should be included in proposals.
- Documents must adhere to the following:
 - Page size – 8 1/2 x 11 inches
 - Margins – 1 inch
 - Spacing – single Font – Times New Roman 12 point

Proposal Format

A. Cover page (1 page)

- Project title and abstract
- Applicant organization
- Point of contact name and full contact information
- Team members (if applicable)
- Funds requested and cost match (encouraged, but not required) to be provided

B. Technical project description and Statement of Project Objectives (SOPO) (3-4 pages)

- Describe the technical and/or economic challenge addressed by the project, how the project addresses the proposal topic, and how PowerAmerica members will benefit from the results of the work. Proposers are encouraged to reference recent comments made by PowerAmerica's members related to priorities in the PowerAmerica Technology Roadmap. A document with these comments is available upon request from PowerAmerica.
- Describe the technical approach to be followed and the facilities and equipment to be used.
- Describe the current state of the art relevant to the work proposed, the proposer's previous, relevant work, its technology readiness level (TRL), and how the state of the art will be advanced and the expected TRL at project completion.
- Describe technical and other risks and describe risk mitigation approaches
- Describe the primary deliverable(s) and how it advances PowerAmerica's objectives.

C. Identification and description of any background intellectual property that may be used in the project, and certification that the proposers have read and understand the provisions of PowerAmerica's Bylaws (revised April 23, 2019) that apply to Member Initiated Projects, including the intellectual property provisions of the Bylaws. (1/2 page)

D. Teaming arrangement, description of roles, and list of key personnel including any informal, uncompensated advisors (1/2 page)

E. Gantt chart or timeline showing monthly progress and quarterly milestones (1/2 page)

F. Budget estimate: See sample format given below; provide figures for each organization if more than one organization is participating and the cost match, if any, for each line item. (1 page)

Budget Sample Format

	PowerAmerica Funds	Applicant Cost Match
Personnel		
Equipment (>\$5,000)		
Supplies & Materials		
Travel		
Indirect Costs		
Total		