

## QUESTIONS AND ANSWERS

PLEASE REFER TO THE GENERAL FAQs SECTION OF ARPA-E'S WEBSITE ([HTTP://ARPA-E.ENERGY.GOV/?Q=FAQ/GENERAL-QUESTIONS](http://arpa-e.energy.gov/?q=faq/general-questions)) FOR ANSWERS TO MANY GENERAL QUESTIONS ABOUT ARPA-E AND ARPA-E'S FUNDING OPPORTUNITY ANNOUNCEMENTS. ADDITIONAL QUESTIONS SPECIFIC TO THIS FOA ONLY ARE INCLUDED BELOW. PLEASE REVIEW ALL EXISTING GENERAL FAQs AND FOA-SPECIFIC QUESTIONS BEFORE SUBMITTING NEW QUESTIONS TO ARPA-E.

### I. Concept Paper Questions:

**Q1. I HAVE A QUESTION REGARDING THE PERFORMANCE METRICS FOR CATEGORY 1, FAST TRIGGERING FOR IMPROVED PROTECTION. THE FOA SEEKS DEVICES FOR "...VERY FAST BY-PASS, SHUNT, OR INTERRUPT CAPABILITY..." (PAGE 5) TO PROTECT AGAINST, FOR INSTANCE, "...EMERGING THREATS, SUCH AS ELECTROMAGNETIC PULSES AND SPACE WEATHER EVENTS ..." (PAGE 6). YET, IN THE "CATEGORY 1 PROGRAM PERFORMANCE METRICS SUMMARY" (PAGE 22), A CURRENT RATING (CONTINUOUS) OF >250 A IS REQUIRED. COULD YOU PLEASE EXPLAIN THE NECESSITY OF SUCH A HIGH CONTINUOUS CURRENT RATING FOR SHUNT PROTECTION DEVICES?**

**ANSWER:** The performance metrics table for protection devices specifies peak and continuous rating of a device/module and were determined after an in-depth analysis of the required performance for many possible converter topologies and structures. Applicants may choose to propose advancements related to in-line protection, shunt protection, or both at the same time (reconfigurable, multifunctional devices). Applicants should justify the performance metrics according to the specific application/technology they are proposing. Applicants should provide an explanation if performance metrics do not apply to the proposed technology.

**Q2. DOES ULTRAFAST COVER PROJECTS THAT WOULD RESEARCH WAYS TO DO THE HIGH VOLTAGE ISOLATION REQUESTED BUT WITH EXISTING SEMICONDUCTOR TECHNOLOGY? OR PUT ANOTHER WAY, WOULD THESE FUNDS BE APPLICABLE TO DEVELOPING A NOVEL CONTROL SYSTEM THAT WOULD WORK WITH EXISTING SEMICONDUCTOR TECHNOLOGY IF WE BELIEVE THE CONTROL SYSTEM ADVANCEMENTS WOULD ALLOW US TO MEET THE PERFORMANCE REQUIREMENTS IN THE FOA?**

**ANSWER:** Proposals addressing improvements with existing/COTS technology using wireless means of control and/or triggering (possibly optical, but other methods may be considered) of power electronic devices/modules are of interest. However, as specified in the FOA, system-level control

schemes and algorithms that do not include advances in device/module technologies are not of interest to ARPA-E under this FOA.

**Q3. WOULD A PROPOSAL BE CONSIDERED RESPONSIVE IF IT ONLY FOCUSED ON MATERIALS DEVELOPMENT THAT ENABLED CATEGORY 1 AND 2 DEVICE METRICS, BUT DID NOT ALLOCATE FUNDING TO DEMONSTRATING THE ACTUAL DEVICE? FOR EXAMPLE, DEVELOPMENT OF GAN VERTICAL POWER DEVICE DRIFT LAYERS WITH THICKNESS AND DOPING SUITABLE FOR 20 KV DEVICES.**

**ANSWER:** Experimental validation of developed device and/or module technology is expected for all technical categories under this FOA.

**Q4. WHAT IS THE PRACTICAL DIFFERENCE AMONG THE PROGRAM OBJECTIVES BETWEEN FOA 0002998 (ULTRAFAST) AND FOA 0002999 (ULTRAFAST SBIR/STTR)?**

**ANSWER:** Please refer to the DE-FOA-0002999 ULTRAFAST SBIR/STTR Funding Opportunity Announcement section 1.B. SBIR/STTR PROGRAM OVERVIEW.

**Q5. WE APPRECIATE IF YOU COULD ANSWER THE FOLLOWING QUESTION:**

**WE ARE PLANNING TO PROPOSE A SOLID-STATE CIRCUIT BREAKER UNDER CATEGORY 1 FOR IN-LINE PROTECTION DEVICE. HOWEVER, UNDER " PROGRAM PERFORMANCE METRICS SUMMARY" DESCRIBED IN PAGE 21, VOLTAGE SLEW-RATE > 500V/NS AND CURRENT SLEW RATE > 200A/NS ARE LISTED. ARE THESE TWO REQUIREMENTS FOR SHUNT PROTECTIVE DEVICE ( I.E SOLID STATE SURGE ARRESTER) AND NOT FOR IN-LINE PROTECTION DEVICE? SPECIFIED VOLTAGE SLEW- RATE IS EVEN ABOUT 5 TIMES FASTER THAN STANDARD LIGHTNING BIL WAVEFORM FOR 15KV CLASS SYSTEM AND IT IS NOT CLEAR WHY THIS REQUIREMENT IS NEEDED FOR IN-LINE PROTECTIVE DEVICE.**

**ANSWER:** The performance metrics table for protection devices were determined after a detailed analysis of numerous possible implementations of in-line, shunt, and reconfigurable/multifunctional protection devices for power electronics converters and systems. Depending on the application/technology proposed, trading between metrics is possible. However, applicants should provide an explanation and justify trading between performance metrics according to the specific application/technology they are proposing.

**Q6. I PLAN TO SUBMIT A CONCEPT PAPER TO ADDRESS CATEGORIES 2 AND 3 AND A PART OF 1. I HAVE TWO QUESTIONS WITH RESPECT TO THE ULTRAFAST FOA.**

- 1. IS PCSS REQUIRED FOR PROPOSALS THAT ADDRESS CATEGORY 1 OR 2? OR ARE ANY POWER SEMICONDUCTOR TECHNOLOGIES ACCEPTABLE AS LONG AS THEY CAN MEET THE SPECS IN CATEGORY 1 OR 2?**
- 2. -- REDACTED --**

**ANSWER:** PCSS is not a required technology for this FOA. ARPA-E is interested in submissions that propose innovations on the device concepts that promise performance at the required levels. Novel



device concepts that span across categories are encouraged, as are ideas that allow incorporation of protection functions within a device or module.