



U.S. Department of Energy
Advanced Research Projects Agency – Energy
Announcement of Teaming Partner List
for an upcoming Funding Opportunity Announcement:
High power density electric motor systems

The Advanced Research Projects Agency – Energy (ARPA–E) intends to issue a new Funding Opportunity Announcement (FOA) in December, 2019 to support the development of novel high power density and efficiency electric motors and power electronics (electric powertrains). The envisioned FOA represents part of a wider ARPA-E effort in developing high efficiency and power density systems that could enable electrified, low- or zero-emissions, long-range aviation. There is a separate and complementary announcement targeting high power density, energy storage and conversion to power system (see link for separate teaming partner list for that program). The overarching goal of the set of proposed programs is to reduce emissions from and increase the efficiency of commercial aviation by developing cost competitive systems for the efficient conversion of the chemical energy of carbon neutral liquid fuels to delivered electric energy, which is further converted to thrust using power electronics, electric motors and propulsors—the latter being the specific focus of this thrust.

Currently the electric powertrain machines suffer from low power densities and low overall efficiency that are necessary to enable a competitive and fully decarbonized aviation for a representative narrow-body class of aircraft. Furthermore, existing electric powertrains are not fully or optimally integrated systems, which lowers the system level performance.

The specific goal of the envisioned FOA is to develop novel and enabling electric powertrain technologies that benefit from novel design topologies, advanced thermal management and co-design of the thermal, electromagnetics, and power electronics as key enablers. Such powertrain technologies developed under the envisioned program will require specific power density, efficiency, voltage, and operational reliability metrics, among others, to enable long range zero-carbon aviation for a narrow-body aircraft, such as the Boeing 737 family, at analogous missions, while ensuring commercial viability.

ARPA–E held a workshop on electric powertrain for aviation in August 2019. Information on this workshop can be found here: <https://arpa-e.energy.gov/?q=workshop/electric-motors-aviation>.

Currently, ARPA–E anticipates that this potential FOA will have two major focus areas:

- 1) Development of high specific power density and efficiency electric motors that meet prescribed operational and reliability metrics.
- 2) Development of associated high specific power density and efficiency power electronics that can be integrated with the electric motor and deliver the system level operational and reliability metrics.

In order to realize the envisioned program goals, expertise in the following areas may be useful: (i) advanced materials and manufacturing, (ii) thermal management, (iii) electric machinery, (iv) electromagnetics, (v) power electronics, (vi) design optimization, (vii) system integration and scale up, (viii) testing at relevant operating conditions, (ix) and techno-economics and technology to market analysis, among others.



As a general matter, ARPA-E strongly encourages outstanding scientists and engineers from different organizations, scientific disciplines, and technology sectors to form new project teams. Interdisciplinary and cross-sector collaboration spanning organizational boundaries enables and accelerates the achievement of scientific and technological outcomes that were previously viewed as extremely difficult, if not impossible.

The Teaming Partner List is being compiled to facilitate the formation of new project teams. ARPA-E intends to make the Teaming Partner List available on ARPA-E eXCHANGE (<http://arpa-e-foa.energy.gov>), ARPA-E's online application portal, October 25, 2019. Once posted, the Teaming Partner List will be updated periodically, until the close of the Full Application period, to reflect new Teaming Partners who have provided their information. A separate and concurrent Teaming list will be posted for the energy storage and conversion portion of the broader zero-carbon aviation initiative.

Any organization that would like to be included on the Teaming Partner list should complete all required fields in the following link: <https://arpa-e-foa.energy.gov/Applicantprofile.aspx>. Required information includes: Organization Name, Contact Name, Contact Address, Contact Email, Contact Phone, Organization Type, Area of Technical Expertise, and Brief Description of Capabilities.

By submitting a response to this Notice, you consent to the publication of the above-referenced information. **By facilitating this Teaming Partner List, ARPA-E does not endorse or otherwise evaluate the qualifications of the entities that self-identify themselves for placement on the Teaming Partner List.** ARPA-E will not pay for the provision of any information, nor will it compensate any respondents for the development of such information. Responses submitted to other email addresses or by other means will not be considered.

This Notice does not constitute a FOA. No FOA exists at this time. Applicants must refer to the final FOA, expected to be issued in December 2019, for instructions on submitting an application and for the terms and conditions of funding.