



**U.S. Department of Energy
Advanced Research Projects Agency – Energy**

Announcement of Teaming Partner List for an existing Topic:

**Solicitation on Topics Informing New Program Areas:
SF₆-Free Routes for Electrical Equipment (SF₆-FREE)**

The Advanced Research Projects Agency – Energy (ARPA–E) has issued a new Topic for the FOAs “Solicitation on Topics Informing New Program Areas” (DE-FOA-0001953) and “Solicitation on Topics Informing New Program Areas SBIR/STTR” (DE-FOA-0001954) to solicit applications for financial assistance in support of technology development aimed at reducing SF₆ emissions from the electric transmission and distribution sector.

As described in more detail below, the purpose of this announcement is to facilitate collaborations among performing teams, including the testing and resource support teams, to respond to the Topic. Please see the Topic under each FOA noted above for specific Program goals, technical metrics, selection criteria and Topic terms. For the purposes of the Teaming Partner List, the following summarizes the Topic:

Today, the electric grid in the United States is responsible for distributing over 4 trillion kWh per year of electricity from generators to consumers. It forms an integrated network that has become an indispensable asset to the nation’s economy, infrastructure, and security. The physical infrastructure of this network depends on a combination of specialized equipment including transformers, switchgear, circuit breakers, converters, switches, circuit switches, and coupling capacitor potential devices. A critical component for the safety and reliability of the electric grid is a man-made gas, sulfur hexafluoride (SF₆). In 1937, GE introduced SF₆ as an insulation gas in the electric industry; since then, SF₆ has become ubiquitous in medium-voltage (MV) and high-voltage (HV) equipment. Among its many key attributes are its intrinsic non-toxic, non-corrosive, and non-flammable nature, in addition to its superior stability over a wide operating window, good thermal conductivity, high dielectric strength, and excellent arc quenching capabilities. These properties make it particularly amenable as an insulating and arc-quenching gas in electrical equipment.¹ As a result, over 90% of gas-insulated switchgear globally uses SF₆ as the insulating gas.² However, SF₆ emissions from the electric transmission and distribution sector pose a significant climate risk as a potent and long-lived greenhouse gas (GHG). One ton of SF₆ emitted to the atmosphere has an equivalent 100-year global warming potential (GWP) of 22,800-26,700 tons of carbon dioxide and has an estimated atmospheric lifetime of 3,200 years.³ As the U.S. and individual states set increasingly ambitious emissions targets, emissions of all GHGs, particularly from the electric grid, will be scrutinized. Furthermore, regulations being considered in places like California and the EU aim to completely phase out SF₆ from electrical equipment, necessarily setting a timeline to develop alternative solutions to SF₆-insulated equipment. Alternative solutions developed today could define the market for decades to come, both in the US and globally.

¹ Wang, Y., *et al.* Processes. **2019**, 7, 216.

² Gas-Insulated Switchgear Market Global Forecast to 2025. MarketsandMarkets. **2020**. [Accessed April 2021].

³ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015.

https://www.epa.gov/sites/production/files/2017-02/documents/2017_annex_6.pdf [Accessed March 26, 2021];

Hodnebrog, O., *et al.* Reviews of Geophysics. **2019**, 58, e2019RG000691



To accomplish this goal, ARPA-E is looking for diverse interdisciplinary teams to foster research and development of alternative technologies which substitute SF6 in gas-insulated equipment (GIE) with alternative gases or gas mixtures, vacuum-based technologies, and/or address SF6 emissions across the life cycle of the equipment. Within the scope of this program and as further described in the FOA documents, ARPA-E expects to evaluate the viability and risks associated with alternative gas solutions, identify potential new alternative gases or gas mixtures that meet or exceed the performance of SF6 at a GWP approximately equal to CO2, accelerate development and testing of vacuum-dry air or vacuum-solid dielectric technologies for high voltage (at or above 245 kV) applications, design sensors that enable earlier leak detection, and create new pathways for the permanent fixation or destruction of SF6 for end-of-life disposal.

As a general matter, ARPA-E strongly encourages different organizations with outstanding scientists and engineers, and across different scientific disciplines and technology sectors to participate in this Program. 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, starting in June 2021. The Teaming Partner List will be updated periodically, until the close of the Full Application period, to reflect the addition of new Teaming Partners who have provided their information.

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 via email or other means will not be considered.

Applicants must refer to the Topic, issued in May 2021 under DE-FOA-0001953 and DE-FOA-0001954, for instructions on submitting an application and for the terms and conditions of funding.