

# Advancing Fusion Materials Discovery

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The Advanced Research Project Agency-Energy (ARPA-E) has the mission to advance high-risk and high-impact technologies that have the potential to transform the energy industry. ARPA-E has invested in advanced fusion systems as part of its program portfolio since the early 2010s. This has galvanized the industry and accelerated both the technical and commercial progress of fusion power in the United States.

As fusion power advance out of the laboratory and into the commercial sector, the survivability of the material remains the major technical challenge that will limit the lifetime of fusion power plants. ARPA-E has historically supported various materials programs to increase the performance of high temperature materials with great success. Recent advancements in machine learning, artificial intelligence, high entropy alloys, and rapid testing provide the opportunity for ARPA-E to extend the materials program to tackle irradiation damage to enable commercial fusion energy. The extreme conditions in commercial fusion power plant plasma facing and structural components would benefit from transformative new materials that does not embrittle, swell, erode, or activate after continuous operation. ARPA-E intends to find such a material, which will significantly reduce the time to market and engineering risk of any first of a kind commercial fusion power plant.

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