

## An Overview of Realta Fusion's Development Path

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Realta Fusion is advancing the axisymmetric magnetic mirror fusion energy concept working in collaboration with the University of Wisconsin-Madison where the currently operational Wisconsin HTS Axisymmetric Mirror (WHAM) experiment is located, a simple mirror using two, 17 T HTS magnets made by Commonwealth Fusion Systems. Following WHAM, Realta Fusion plans to build a commercial scale, high-field simple mirror called Anvil. This device will serve as a key remaining physics and technology risk-retirement platform operating at full scale, with the primary physics deliverable to demonstrate the stable sustainment of “end-plug” plasma conditions needed for the construction of an axisymmetric tandem mirror fusion pilot plant.

Additionally, Anvil, though it will operate with a sub-gain plasma power balance  $Q_{\text{sci}} \sim O(10^{-1})$ , can be optimized to generate significant DT neutron wall loadings  $\langle W_n \rangle \sim 0.5 - 1 + \text{MW/m}^2$  over a large irradiation volume  $\sim 5 \text{ m}^3$ , providing access to high DPA rates with a DT fusion neutron spectrum as a volumetric neutron source (VNS). Technology and engineering requirements for the realization of the Anvil device will be provided, including a path to optimize the device to serve as a VNS for a variety of use cases, such as the testing and qualification of fusion device materials and test blanket modules.

Following the full-scale demonstration of end-plug plasma conditions in Anvil, two end-plugs will be connected to an extended central cell to construct Hammir, an axisymmetric tandem mirror fusion pilot plant (FPP). Technology and engineering requirements for Hammir will be provided and compared to those for Anvil. Hammir will be designed to meet or exceed the requirements for a commercial FPP as defined in the National Academies of Sciences, Engineering, and Medicine (NASEM) report “Bringing Fusion to the U.S. Grid” by demonstrating an electric gain  $Q_e > 1$  while producing net-electricity  $P_{e,\text{out}} > 50 \text{ MWe}$  for at least three hours continuously. Opportunities for other potential uses of both the Anvil and Hammir devices will be briefly presented as well.