

PFRC 1 MW engineering scale model

PFRC

Compact Fusion Reactor

The PFRC fusion reactor is a novel approach to fusion power generation prioritizing cleanliness – low neutron production – and small size.

About Us

Princeton Fusion Systems is developing the *Princeton FRC* (PFRC), a fusion microreactor, in collaboration with the Princeton Plasma Physics Laboratory. The PFRC has been supported by the DOE and NASA in addition to ARPA-E.

Problem

The world needs clean power. The market needs a source of firm, carbon-free power at low capital cost.

Solution

The PFRC is a globally deployable 1 to 10 MW fusion microreactor. It's modular and scalable, whether the power need is 1 MW or 200 MW. PFRCs would be built in a factory and shipped, fully fueled, to the customer.

Product

The PFRC uses an innovative radio-frequency heating method and a simple linear magnet configuration. Field-Reversed Configurations, *FRCs*, can achieve the high temperatures needed for advanced fusion fuels.

ARPA-E OPEN

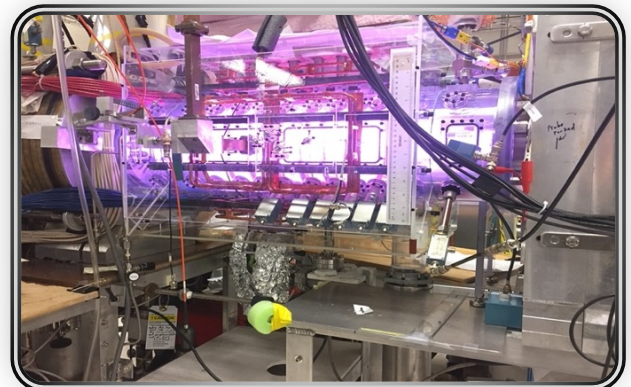
Our OPEN grant has funded upgrades to the PFRC-2 needed to shift from electron heating to ion heating, a critical milestone. Specifically: increase the magnetic field by a factor of 10, increase the heating power by a factor of 5 and lower the frequency a factor of 4.

Market

The world energy market is \$5T. Portable power in the US alone is \$30B. The PFRC has unique and diverse applications to modular power plants, remote industry, mobile power and even space propulsion.

Strategy

The first PFRC prototype reactor will likely be for a high-value military or space application. A commercial reactor design will follow.

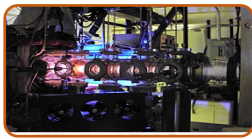


PFRC-2 in operation at PPPL



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Programmatic Support for PFRC



MNX, Magnetic Nozzle Experiment

- DOE 1998-2015
- PPPL



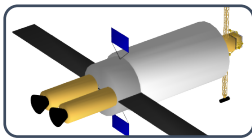
PFRC-1 a, b, c, d Experiment

- DOE FES 2002-2009
- PPPL



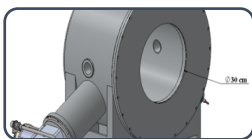
PFRC-2 Experiment

- DOE FES 2010-2016
- PPPL



NIAC Space Fusion Drive

- NASA 2016-2019
- PFS w/PPPL



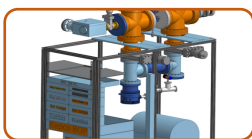
Superconducting Magnets STTR

- NASA 2017-2021
- PFS w/PPPL



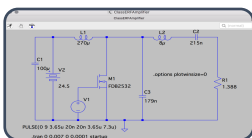
Next-Generation PFRC

- ARPA-E OPEN 2019-2022
- PFS w/PPPL



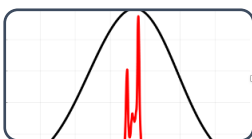
Charge-Exchange Ion Analyzer Diagnostic

- ARPA-E 2019-2022
- PPPL



Wide Band Gap Amplifiers

- ARPA-E GAMOW 2021-2023
- PFS



Spectroscopy Field Diagnostic

- DOE INFUSE 2021-2022, ORNL w/PPPL and PFS