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Neutral-beam-injection fueling for a small, D-3He burning, field-reversed-configuration reactor MICHAEL BUTTOLPH, Applied and Engineering Physics, Cornell University, DAREN STOTLER, SAMUEL COHEN, Princeton Plasma Physics Laboratory — Rocket propulsion powered by the D-^{3}He fusion reaction in a Field Reversed Configuration (FRC) has been proposed for a variety of solar-system missions. Two key unique features of this concept are a relatively small, 25-cm-radius, plasma core and a relatively thick (10 cm), dense (1e14 cm^3), and cool (100 eV electron temperature) scrape-off layer (SOL). The SOL contains the heated propellant – likely hydrogen, deuterium or helium – and also fusion reaction products at a lower density (ca. 1e12 cm^{-3}). A critical design question is the refueling of the fusion reactants. A moderate energy neutral-beam method is considered. It must be able to penetrate the SOL without significant losses but must be stopped in the core. DEGAS 2, a Monte-Carlo code designed to model neutral transport, was implemented to simulate beam-plasma interactions including ionization and charge exchange of the neutral beam's helium-3 and deuterium atoms by impact in the SOL and core plasma with thermal plasma constituents and fusion reaction products. Operational methods to alleviate the effects deleterious reactions such as deuterium charge-exchange in the SOL are described.

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