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Designing microscale gas discharges to enhance thermionic energy conversion JOHN HAASE, DAVID GO, University of Notre Dame — Thermionic energy converters (TECs) are devices that convert heat directly to electricity via thermionic emission. In a TEC, a hot cathode emits electrons that are then collected by a cold anode, and when passed through a load, produces electrical work. However, the emitted electrons can build-up between the electrodes, retarding the current. Two strategies to combat the build-up negative space charge are to reduce the interelectrode gap, preferably to the micron-scale, or to introduce a positive space charge, a plasma. Previously [1], we showed that microscale inert gas plasmas could perform this role, and enhance thermionic emission, under steady state conditions. However, because energy must be injected to ignite the inert gap plasma, a microplasma-enhanced TEC device must be operated in a pulsed mode in order to achieve net power generation. In this work, we use the plasma modeling software Zapdos [2] to model an inert gas (argon) microplasma-enhanced TEC. We explore the effect of various system parameters on the net power produced by these TECs, and optimize the system parameters to maximize power output. [1] J. R. Haase and D. B. Go, J. Phys. D. Appl. Phys. 49, 55206 (2016). [2] A. D. Lindsay, D. B. Graves, and S. C. Shannon, J. Phys. D. Appl. Phys. 49, 235204 (2016).

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