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Integrated Studies of Solenoid-Free Tokamak Startup with Pegasus-III[1] M.D. NORNBERG, M.W. BONGARD, S.J. DIEM, J.A. GOETZ, R.J. FONCK, B.A. KUJAK-FORD, B.T. LEWICKI, A.C. PALMER, J.A. REUSCH, A.C. SONTAG, G.R. WINZ, University of Wisconsin-Madison — Minimizing or completely eliminating the need for induction from a central solenoid during startup, ramp-up and sustainment of a tokamak plasma is a critical challenge in magnetic fusion. To address that challenge, the Pegasus-III facility is under construction to provide a dedicated US platform for non-solenoidal tokamak startup and sustainment studies. Its mission is to perform comparative studies of leading techniques for solenoid-free startup and provide guidance for 1 MA startup in NSTX-U and beyond. These include: local helicity injection (LHI); coaxial helicity injection (CHI); RF-aided and RF-only startup; and PF induction. Topics of study include current drive efficiency and confinement scalings at increasing $B_T = 0.6$ T and $I_p = 0.3$ MA, testing synergistic effects by combining techniques, and supporting technology development. The new facility features: a solenoid-free centerstack; an innovative 24-turn TF coil system with dynamic stress compensation; new divertor coils that also support CHI; new digital control systems for all magnet and HI power systems; and an initially-modest electron Bernstein wave (EBW) heating system. The science program will first establish high-I_p LHI scenarios, followed by deployment and test of transient CHI, and eventually a modest sustained CHI system. Low-power EBW studies will be developed in the second and third year of operation. Expansion of the RF systems to provide RF-only initiation and sustainment is under evaluation.

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☐ Prefer Oral Session
☒ Prefer Poster Session

Special instructions: Please place as poster 1/4 in the Pegasus grouping.

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