Q1:
Run axisymmetric nonlinear time-dependent computations with realistic ELM equilibria as initial conditions to find nearby states that represent force-balance in the numerical representations used for 3D studies. This will improve the quality of the 3D macroscopic evolution in the transition from the large pressure gradient inside the separatrix to zero pressure gradient outside the separatrix.

Q2:
Perform extended, linear perturbation studies to investigate the role of plasma edge density gradients. The density profiles will be used in spatially varying diffisivity coefficients, and they will be incorporated in extended-MHD effects. The shaping of the computational domain will also be improved to more accurately represent the DIII-D wall.

Q3:
Incorporate refinements from Q1 (equilibria) and Q2 (increased realism of DIII-D geometry and profiles) into nonlinear scoping studies.

Q4:
Increase resolution in simulations of macroscopic plasma edge phenomena. Optimizing confinement and predicting the behavior of burning plasmas require improved simulations of edge and core plasma phenomena, as the characteristics of the edge can strongly affect core confinement. For this quarterly milestone, we will simulate nonlinear plasma edge phenomena using extended MHD codes with a resolution of 40 toroidal modes.