Theory needs for SFPS and Disruption Mitigations Studies (R. Raman, et al., 17 Feb 2011)

- Using a resistive 3-D MHD model, determine the conditions for generating flux-surface closure at the end of the injection time, as in the experiment. (e.g. resistive effects, localized magnetic fluctuations).
  - Obtain quantitative comparison with experiment and quantify the influence of the time-changing flux on the dynamics of the CHI plasma

- Using 2-D and 3-D MHD models, determine scaling of electron heating and temperature, etc., with injection parameters and electron thermal transport and the resulting effect on plasma current, size, flux-surface closure, etc.

- Understand the requirements for current drive by neutral beams in a CHI or point source helicity injection generated target; determine conditions to successfully drive the current (e.g. is additional heating needed?), maximize plasma current, etc.

- Understand the scaling of CHI current generation with respect to the amount of injected poloidal flux and injector current to allow extrapolation of the process to large devices

- Develop a 3-D MHD model of point source helicity injection to understand the physics of current generation in NSTX-U under these very localized helicity injection conditions

- Through 2-D axis-symmetric or 3-D MHD models understand the relationship between electrode driven current and impurity generation and their impact on the performance of the resulting discharge

- Understand the penetration of a high-density gas plume through the energetic SOL region