



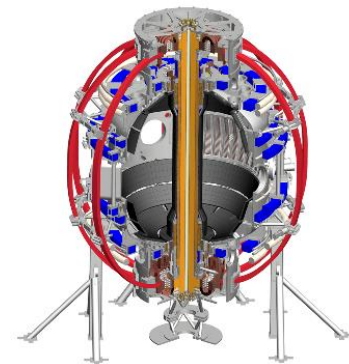
U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# MS TSG Suggestions for FY17 Milestones

January 6, 2017



# Milestone ideas

- Main idea for FY17: error field correction (next few slides)
- Tearing mode
  - Ideas from Jong Kyu and Lucas Morton?
- Improvement of global MHD stability through rotation profile control
  - Joint with Integrated Scenarios Group (discussed at their meeting today)
  - Expand stability physics investigation of rotation data (NSTX-U) / newly-modeled rotation profiles from TRANSP runs of NSTX-U
  - ISG component of the actual rotation control element itself
- NTM Entrainment in the ST
  - New data would come from National Campaign proposal if granted
  - Development for TM mode locking prevention in the ST with external coil

# Assess the sources of, and potential methods for correcting, error fields on NSTX-U

- **Goals:**
  - Define coil alignment requirements
    - TF / PF alignment requirements, max TF tilt, engineering implementation, final metrology + in-vessel B-field measurements
  - Develop expected optimal EFC settings for the next run
    - Aim to minimize commissioning time spent correcting error-fields
- **Multi-pronged approach:**
  - Coil and vessel metrology
    - Measure the geometry of the PF and TF coils, and calculate the expected error fields given measured imperfections in these coils
  - Simulations and numerical modeling
    - Model the error fields due to eddy currents in the NSTX-U vacuum vessel
    - Calculate the plasma response to these fields and the prognosis for correcting these fields with the NSTX-U RWM coils
  - Physics analysis of NSTX-U data
    - Validate these error field models against NSTX-U compass scan data obtained in the FY16 run campaign
  - Directly characterize EF sources
    - Dedicated B-field measurements (vacuum fields during outage)

# Assess the sources of, and potential methods for correcting, error fields on NSTX-U

- **Status:**

- Preliminary physics analysis and coil metrology are complete
- Simulations and modeling underway (N. M. Ferraro, J.-K. Park)
- Will issue draft report on EF sources (PF5, TF tilt) by 31 January
- Motivate further metrology, dedicated B-field measurements

# C. E. Myers: Vacuum Fields During the Outage

- **Request vacuum field campaign during the outage:**
  - Pulse PF2/3/4/5 with the center stack removed
  - Single coil DC and AC vacuum shots
- **Benefits for error field correction:**
  - Install dedicated magnetic sensors in the plasma volume to measure vacuum error fields
  - Directly characterize EF sources, including outer PF coils and outer vessel induced currents
  - Confirm metrology results, develop correction strategy
- **Ancillary benefits:**
  - Improved RWMEF sensor calibrations → AC vacuum shots
  - Develop EFC characterization technique for future use
  - Exercise TRANSREX and SPA rectifiers during the outage
  - Opportunities for other researchers (e.g., SPA noise characterization)