

# Settling on Reference Design and Preparing for PVR

## I. Reference Design

- Have 3-period candidate configuration.
- Continued exploration would likely produce improved configurations.
  - Explore 2-period, 4-period, and 2+4 hybrid configurations. Hybrids may be particularly promising.
  - 3-period configurations: bootstrap self-consistency, improvements in stability and transport.
- When do we need to freeze configuration for engineering studies?
  - Cannot do engineering studies until we have coil design?
  - Coil design still in tool development phase? Can focus on particular configuration for this purpose, but will be able to quickly generate coils for new configuration when tools developed?

## II. Continuing Configuration Exploration After Reference Design Chosen

- Modify reference design in response to feedback from engineering studies, further physics evaluation.
- Refine reference design to improve stability and transport (including ideas of Russians).
- If 3-period configuration chosen, continue studies of 2-period configurations as backup (insurance)?

### III. Preparing for the PVR

#### Physics Calculations for the Reference Configuration

- Convergence studies to verify equilibrium and stability calculations: Ku.
- Flux surface integrity in free-boundary equilibrium (PIES): Monticello, Hughes, Oliver
- vertical stability (CAS3D): Redi, Monticello.
- self-consistent bootstrap currents: Monticello, Hughes, White.
- bootstrap current effect on magnetic islands (PIES): Monticello, Hughes.
- energetic particle confinement: Redi, White.
- benchmark Terpsichore external kink calculations against CAS3D: Redi, Fu
- high  $n$  global ideal modes (CAS3D): Redi.
- gyrokinetic calculations: Mynick, Lin.

- kinetic stability calculations for electrostatic modes of potential importance for anomalous transport: Rewoldt.

**Robustness.** Perturb profiles and boundary. Look at:

- free-boundary VMEC equilibrium.
- flux surfaces (PIES): Monticello, Hughes, Oliver.
- ballooning: Ku
- confinement: Mynick
- kink stability: Fu
- vertical stability: Redi
- energetic particle confinement: Redi
- bootstrap currents: Monticello, Hughes

**Startup.** Generate sequence of free-boundary equilibria.

Physics properties evaluated as above.

**Flexibility.** Generate free-boundary equilibria accessible with given coil set. Evaluate physics properties.