Summary slide for OV/P-6, "Fusion Energy Development Applications Utilizing the Spherical Tokamak and Associated Research Needs and Tools" by J.E. Menard, et al.

- International ST research and facility representatives have identified research goals and performance targets for a range of fusion energy development applications ranging from plasma-material-interface science facilities to power reactors
- Team is also surveying present/near-term ST facility capabilities to support long-term fusion application development, and identifying key gaps between present/planned capabilities and next-steps
- Potential gaps assessed include:
  - Non-inductive current start-up/ramp-up and sustainment
  - Core and edge stability
  - Transport / energy confinement
  - Core-edge integration
  - Plasma-wall interactions and power exhaust
  - Long-pulse actuators for heating, current drive and control
- *See next slide for additional detail*

OV/P-6: Summary of research needs to support next-step STs

- MHD stability, access to low ν^* covered by near-term STs
- NSTX-U plans access to high f_{BS} and full non-inductive
  - Need to extend to 70-95% bootstrap fraction for reactor-relevant scenarios
- Near-term STs limited to $1/\rho_{i*} \leq \approx 50\text{-}120$
  - Need to extend to 200-300 with new facility (?) and/or leverage tokamak results
- Full performance ST-40 could test ST λ_q scaling to high B_P
- Very high $q_{||}$ in next-steps requires divertor innovation
  - MAST-U Super-X capability and/or liquid metals (LTX-β, long-term NSTX-U)
- Very compact ST reactors (R=3-4m) generate high neutron wall loading and require innovations in blankets and first-wall