Physics and technology to enable compact fusion pilot plants (for fusion technology submission)

- Cover confinement and stability scaling of fusion gain
  - $Q^*_{DT} \approx Q_{DT}/(1+\lambda_{DT}Q_{DT}) \propto H^2 (\beta_N C_{BS}/f_{BS})^2 f_{gw}^{0.7} B^3 R^2 \kappa^3 \varepsilon^{1.5}$
    - Above exponents for ≈ Petty-type scaling: $\Omega_i \tau_{th} \propto \rho_*^{-3} \beta^0 \nu_*^{-0.3} q_{95}^{-1.1} \kappa^{2.2} \epsilon^{-0.8} A^{0.5}$
- Use this to motivate high-leverage parameters:
  - Physics: higher H, β_N, η_{CD}, κ
  - Technology: B, η_{CD}
- HTS not only high field, but also very high $J_{winding\text{-}pack}$
  - Can operate at HTS field limit for wide range of aspect ratio
  - Low A~1.8-2.5 w/ HTS TF attractive for FNSF / Pilot plants
  - Low-A minimizes TF magnet, but increases blanket size
  - Impact of inboard shield, solenoid on missions and optimal A
- High H → Li walls, high β_N & κ → advanced control