**Cryostat:** Duchateau J. *et al* 2014 *Fusion Eng. and Des.* **89** 2606–20

Steady-state heat load = (1+k2)Rr

1. R = major plasma radius
2. r = minor plasma radius
3. k = plasma elongation

Cost will be proportional to ITER based on the steady state heat load.

**Cryoplant:** Duchateau J. *et al* 2014 *Fusion Eng. and Des.* **89** 2606–20

Efficiency of cooling to actual power = Tcool/(Twarm – Tcool)

Converting 15K cooling to 4.5K cooling:

Wmin = ( Thot/Tcold – 1) x Qcool = 19 W to cool 1 W @ 15K

Wmin = 66 W to cool 1 W @ 4.5 K

Wmin = ( Thot/Tcold – 1) x Qcool = 2.75 W to cool 1 W @ 80K

1 W @ 4.5 K ~ 3.47 W @ 15 K 🡪 cooling capacity at 4.5 K = Q\_total/3.47

1 W @ 4.5 K ~ 24 W @ 80 K 🡪 cooling capacity at 4.5 K = Q\_80/24

η = 0.141 [R (kW)]0.26

Operation cost = Q\_total/ η/ ηcarnot \* 365\*24\*0.1

[ref1] Estimating the Operating Cost of Superconducting

Magnet Systems at Various Operating Temperatures

[ref2] Summary of the ITER Final Design Report

[ref3] Conceptual design of the cryogenic system and estimation of the recirculated power for CFETR - doi:10.1088/1741-4326/57/1/016037