

Homework 5

Web Problem #5

1. What is the pumping power required for an AP1000 plant primary system under steady state conditions, assuming a core power of $3,415 \text{ MW}_{\text{th}}$, a pressure drop of 778 kPa, a hot leg temperature of 610 °F and a cold leg temperature of 537.2 °F?
2. Calculate the core maximum volumetric heat generation rate (q''') and the core maximum outside surface heat flux (q'') values for each of the 6 primary reactor types. Use the linear heat rate (q') listed in the class notes to perform these calculations. Why is there no linear heat generation rate listed in any text for a MSR?
3. **Team Problem:** Select your reactor coolant salt, and fuel type. Give strong justifications as to why you picked this salt and fuel. Be sure to consider (qualitatively, not necessarily through actual calculations) thermalhydraulic, neutronics, and materials considerations. Finally, please provide the known thermodynamic properties of your coolant and fuel, including density, heat capacity, thermal conductivity, viscosity, and surface tension. Ideally, provide a correlation or plot that indicates temperature dependence. If this is not available, provide a single value and note the reference temperature. If nothing is available, develop a strategy for approximating (theoretically, not experimentally) the thermodynamic property in question. Provide justifications for this strategy.