5.3 Core design: an LMFBR example

An illustrative LMFBR core design follows very similar lines though with numerical differences. The chosen fuel rod diameters are significantly smaller in order to allow higher heat fluxes (typical fuel rod radii are 0.38 cm). Liquid sodium coolant temperatures of the order of $820°K$ mean a maximum temperature difference between the fuel rod center and the sodium coolant of about $1500°K$. According to equation 2, section 5.1.3, this implies a maximum heat flux of 490 W/cm. If an *average* maximum heat flux of 290 W/cm is chosen equation 2, section 5.3, and equation 1, section 5.3, imply a reactor radius R of 1.1 m for a 2600 MW thermal generating plant (it has again been assumed that the fuel takes up one-half of the volume of the core). This reactor radius is close to the actual, typical volumetric-equivalent radius of an LMFBR core of 1.1 m, much smaller than a LWR core of the same power.