Homework 20

Web Problem #5

1. It is found that, in a certain thermal reactor, fueled with partially enriched uranium, 13% of the fission neutrons are absorbed in resonances of 238U and 3% leak out of the reactor, both while these neutrons are slowing down; 5% of the neutrons that slow down in the reactor subsequently leak out; of those slow neutrons that do not leak out, 82% are absorbed in the fuel, 74% of these in 235U.
    a. What is the multiplication factor of this reactor?
    b. What is its conversion ratio?

2. Write a summary of the benefits and disadvantages of light water SMRs with respect to conventional LWRs.

3. Your millionaire friend wants you to power his private island for the next 60 years by designing an RTG. His island requires 96 kW, and your source should provide at least this much electricity.

    a. Assuming that your device has an efficiency of 10%, and that you are using ^{137}Cs, what is the mass of the GPHS that is needed for this system?
    b. If you decide to design this system to generate 240 kW initially, how long will your system provide sufficient power to his island?