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ACRR Steady State Power Determination by Nickel Foil Activation

The Annular Core Research Reactor at Sandia National Labs is a pool-type research reactor that has been in operation since 1978. The reactor is capable of operating in the steady state mode at 2.4 MW and in the pulse mode up to 60,000 MW. The reactor core is located near the bottom of a 29’ deep 10-foot diameter pool. The pool is right-circular cylinder in shape and holds some 13,750 gallons of water. Heat generated from the reactor can be rejected via the use of a primary and secondary circulating water systems that ultimately release thermal energy out of a cooling tower.

During steady state calibration operations each year, the ACRR operates with the primary water system secured for the purpose of measuring pool temperature heatup to determine reactor power output. This method has been used for several decades to calibrate the plant protection system % power channels. However, this method provides an over-conservative approach as it is difficult to determine if and when all the pool water is heating at the same rate.

A new proposed method to determine power would be to locate nickel foils into the 9” diameter dry central cavity that is located symmetrically in the center of the reactor. Activation of the nickel foils would provide total fluence of the reactor with the flux peak to average values and energy per fission already known and well documented. Steady State % power would then be calibrated to a more reliable traceable standard than by water temperature.

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