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2 MW Engineering Projects of The McClellan Nuclear Radiation Center

Anthony L. Brinkley, Alan R. Dailey, Robert S. Ferwerda, McClellan Nuclear Radiation Center

Abstract

Over twenty separate modification projects were implemented in order to upgrade the McClellan Nuclear Radiation Center (MNRC) from 1 MW to 2 MW. Changes were made to every main system of the reactor. To help increase power levels, the core structure was changed from a circular to hexagonal grid plate geometry, requiring underwater drilling of the core barrel. The new grid plates and safety plate were part of a General Atomics design. The cooling water flow rate was increased from 350 to 1 000 GPM in both the primary and secondary circuits. All the primary and secondary piping was replaced with eight-inch piping. A new heat exchanger, cooling tower, primary, and secondary pumps were installed. A support structure for the control rod motors, silicon doping assemblies, and day-to-day operations were added in the reactor room to increase accessibility and safety. An emergency core cooling system (ECCS), auxiliary make-up water system (AMWS), and improved reactor room ventilation were added as safety precautions in case coolant was lost. Careful scheduling ensured minimum impact on production workloads.

MNRC 2 MW Core Characteristics

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Abstract

The McClellan Nuclear Radiation Center (MNRC) TRIGA reactor has been upgraded for nominal 2 MW steady-state operation in order to increase the MNRC's irradiation capabilities (the MNRC reactor was previously licensed for nominal 1 MW operation). The work involved replacement of existing and/or installation of new equipment necessary to operate at the new power. The primary systems affected were the reactor core components, reactor control system, reactor cooling systems, and shielding. Modification to the reactor began

August 19, 1996, and the first 2 MW operation was achieved on April 14, 1997. Fluxes were measured in the radiography bays and around the reflector. Core parameters for extended 2 MW operation (fuel temperature, xenon poisoning, core excess, and control rod worths) were measured.

Radiological Controls Associated with a Major Cavity Cut in the Biological Shield of the MNRC

Jeff Ching, Kirsten Ulowetz, McClellan NRC

Abstract

The McClellan Nuclear Radiation Center (MNRC) research reactor underwent a major upgrade from 1 MW to 2 MW during the period August 1996 to March 1997. Part of the upgrade was construction work to create a large cavity in the biological shield surrounding the reactor tank. The cavity cut was the first phase of a project to perform boron neutron capture therapy research. The radiological controls established for the construction work resulted in no loose surface contamination, no airborne radioactivity, and low radiation exposure.

Upgrades and Modifications to the Kansas State University Reactor Facility

Brendan Ryan, Kansas State University

Abstract

In recent years the reactor facility has made several upgrades in equipment and instrumentation to ensure relicensing in 2001. Being a relatively small facility, lack of financial means and personnel resources severely limit such projects. through the generosity of DOE Instrumentation grants and TRTR member assistance, most of our goals have been completed. These goals included a modernization and replacement of the reactor control systems, instrumentation, and cooling system. Planning and evolutions will be discussed, as well as safeguards issues. This experience may prove useful to other TRTR members approaching relicensing.

Beryllium Reflector Change out And Upgrade at the High Flux Isotope Reactor

Colin West, Oak Ridge National Laboratory

Abstract

Work on upgrades to the High Flux Isotope Reactor, based on proposals described at last year's TRTR meeting has begun. Present efforts focus on enhancements of the neutron scattering capabilities. A routine replacement of the "permanent" beryllium reflector, scheduled for 1999, will provide an opportunity to enlarge two of the beam tube thimbles. A small supercritical hydrogen cold source, presently in the design and testing phase, will be inserted into one of them, and three cold neutron beams will be made available. Following the reflector changeout shutdown, space will be available in a new building for two SANS machines, and three other instruments, to use the cold beams. The other enlarged thimble, a radial port with its nose in a very high flux region, will initially feed three thermal supermirror guides and six instruments within the reactor confinement building. It is proposed that later two more guides will be added, and these five thermal beams will feed up to 15 instruments In a proposed new guide hall.