THE WINDSCALE FIRE

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A graphite fire in the Windscale No. 1 reactor occurred during the period October 8-12, 1957. The Windscale reactors were located on a coastal plain in northwest England and were used to produce plutonium. A great wealth of information was gathered on the causes, handling, decontamination, and environmental effects of reactor accidents.

Figure 1 shows the front face of the Windscale reactor, which is similar to the X-10 reactor at Oak Ridge, Tennessee. The X-10 pile operated from 1943 to 1963, and it also used natural uranium "slugs" as fuel. As at Windscale, the fuel was pushed into horizontal tubes on "channels" that penetrated the huge "pile" of graphite. Inserted from one face, the fuel was left in the channels for a predetermined number of megawatt days per ton and then pushed out the opposite face. The ejected fuel slugs fell into a canal for underwater loading into casks and transport to the chemical processing area.

Cooling for these reactors was by forced draft, and the cooling air was passed through filters in a large gallery atop a 400-foot stack from which it was released into the environment. Figure 2 shows a front view of the loading face of the reactor. The Windscale reactors were hexagonal when viewed from the front or back. The graphite core measured 50 feet by 50 feet, was 25 feet thick, and was surrounded by concrete shielding; the charging face, shown edge on in Figure 2, was shielded so that work could be done in this area when the pile was not in operation. The control room was located outside a second concrete shield. The control rods were positioned vertically in the graphite, suspended, and operated from the top. A special scanner gear was located in a void in the discharge space behind the core so that readings could be made to determine which channels were involved when fuel failures occurred.

THE CAUSE OF THE FIRE

When the Windscale reactors were built, it was known that graphite irradiated by neutrons could store energy in the crystalline lattice, and, if allowed to build sufficiently, could be released quickly in an uncontrolled fashion to result in very high temperatures. It also was known that the build-up could be controlled by a thermal annealing process. This "Wigner" energy was to be annealed by the operating crew on October 7, 1957. In order to accomplish this, the blowers were switched off early in the afternoon on October 7, and in the

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