

WCAP-6068

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IN NUCLEAR SCIENCE ABSTRACTS

WCAP-6068
UC-80, Reactor Technology

EVALUATION OF MASS SPECTROMETRIC AND
RADIOCHEMICAL ANALYSES OF YANKEE CORE I
SPENT FUEL

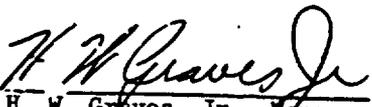
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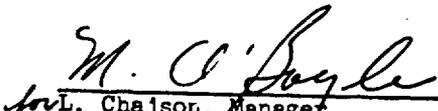
March 1966

Prepared for the New York Operations Office
U. S. Atomic Energy Commission
Under AEC Contract Number AT(30-1)-3017

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ABSTRACT

This report presents the results of mass spectrometric, X-ray spectrographic, and radiochemical analyses of spent fuel samples from 219 locations in the Yankee core. These sample locations were pre-selected to provide: 1) the U and Pu isotopic composition of the fuel as a function of burnup in the asymptotic and perturbed reactor neutron spectra; 2) the spatial distribution of burnup and fuel isotopes in the rods, in the assemblies, and in the core; 3) the total isotopic inventory of the core; and 4) fuel characteristics, including the specific Pu production, the effective capture-to-fission ratio in U-235, and the net mass of fissile materials destroyed per unit of energy release in the fuel.

Values of burnup are inferred over a broad range (1,200 to 31,000 MWD/MTU) from relationships between U and Pu concentrations measured before and after irradiation, and from the activities of the Cs-137 and Sr-90 fission products. The calculations used to infer burnup and the various fuel characteristics from the spent fuel data are described in detail.

The consistency and reliability of the data are established through the evaluation of the experimental results obtained from a number of inter-laboratory cross-check and monitor sample solutions.