

Radiation Engineering and Analysis

Background

Operators of nuclear power plants frequently face problems that require accurate characterization and analysis of radiation. The wide-ranging difficult issues that can arise can be far beyond the scope of typical radiation analyses, such as nuclear fuel design and accident analysis services. The Westinghouse team of radiation experts can answer the tough questions on radiation analysis, and Westinghouse offers a suite of products to assist with radiation and thermal measurements.

Description

Westinghouse provides a full suite of radiation analysis services for pressurized water reactors (PWRs) and boiling water reactors (BWRs), including (but not limited to):

- Neutron fluence and gamma-ray heat generation rate calculations
- Reactor dosimetry and surveillance capsule analysis
- Support for radiological equipment qualification
- Material activation analysis for waste characterization and decontamination and decommissioning (D&D)
- Source term calculations
- Radiological impact assessments for power uprates and major component modifications

- Shielding design
- Spent fuel storage analysis, including source terms and decay heat
- Radioactive material transportation, storage and disposal analysis
- Technology transfer and training programs
- As low as reasonably achievable (ALARA) planning and design

The radiation engineering and analysis team at Westinghouse has recently provided support for radiation-related licensing activities for:

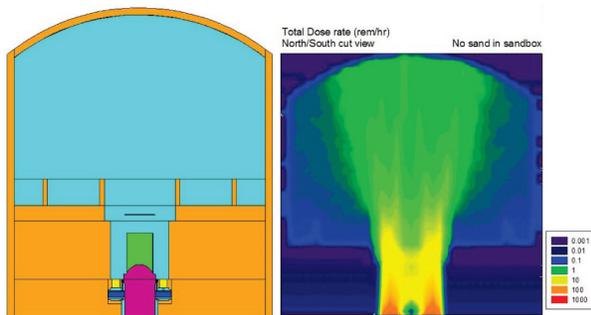
- AP1000® nuclear reactors
- Toshiba advanced boiling water reactors
- Westinghouse small modular reactor

Westinghouse offers products to support aging management and life extension of plant equipment. Refer to the separate flyersheets for the following products:

- Ex-Vessel Neutron Dosimetry (EVND)
 - Passive sensors that measure the neutron exposure of the reactor vessel and support structure
- Equipment LIFETIME™ Monitor (ELM)
 - A compact, passive package for monitoring radiation and thermal conditions around plant equipment
- RadTrack™/RAPTOR-M3G
 - A software tool for tracking a reactor's plant-specific radiation environment

Case Study: Sandbox Shielding Evaluation

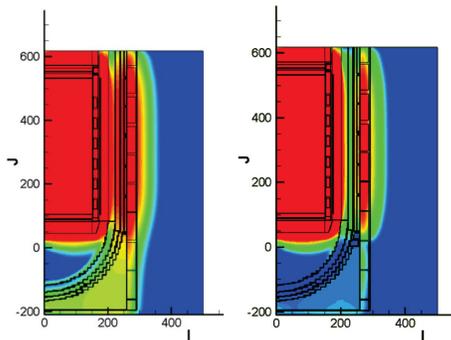
During outage inspections, a customer identified sand leakage from the sandboxes that covered the reactor vessel inlet and outlet nozzles. Sandbox leakage increases the radiation coming from the nozzle inspection ports, resulting in a greater radiation dose to personnel and hardware, and potentially exceeding equipment environmental qualification (EEQ) limits. Westinghouse was contacted to determine dose rates during normal operation at various locations in containment under a variety of scenarios. Westinghouse rapidly completed the analysis and enabled the customer to justify continued operation with no interruption.



Radiation traveling through the containment building during operation

Case Study: AP1000 Lower Reactor Cavity Shield Design

In light water reactors, neutron leakage through the reactor pressure vessel activates the components in the reactor cavity.

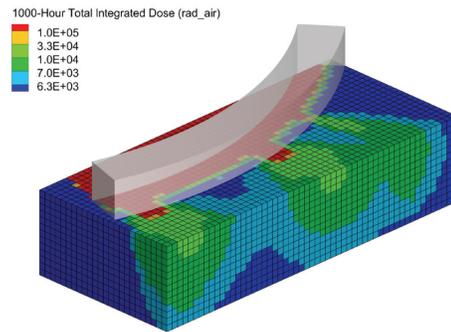


AP1000 lower cavity post-shutdown radiation levels before and after shield design

This activation and the resulting radioactivity in the AP1000 would lead to potentially unacceptable dose rates in the area underneath the reactor during shutdown. With minimal impact to the existing design and no inhibition of operational airflow requirements, Westinghouse developed a shield that would provide operational and shutdown radiation shielding for the lower reactor cavity.

Case Study: Radiological Equipment Qualification

Westinghouse was contacted by a customer wanting to update the radiation doses associated with components in the auxiliary building under post-accident conditions, including radiation streaming from the containment building through electrical and piping penetrations. Westinghouse performed detailed calculations, considering all possible source terms, and provided the customer with doses applicable to selected components and zone maps depicting where radiation levels crossed critical thresholds.



Radiation streaming into the auxiliary building through mechanical penetrations in containment

Benefits

Westinghouse applies state-of-the-art tools and techniques, and leverages many decades of industry leadership on every problem.

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