



Design of a Loss of Coolant Blowdown Capsule for Remote Assembly with High Burnup Fuel

May 2024

Changing the World's Energy Future

Klint Stephens Anderson, Jerry Anthony Kahn III, Colby B Jensen, Jason L Schulthess, Austin D Fleming, Philip G Petersen, Jordan Michael Argyle, Cindy Fife



DISCLAIMER

This information was prepared as an account of work sponsored by an agency of the U.S. Government. Neither the U.S. Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness, of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. References herein to any specific commercial product, process, or service by trade name, trade mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the U.S. Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or any agency thereof.

Design of a Loss of Coolant Blowdown Capsule for Remote Assembly with High Burnup Fuel

Klint Stephens Anderson, Jerry Anthony Kahn III, Colby B Jensen, Jason L Schulthess, Austin D Fleming, Philip G Petersen, Jordan Michael Argyle, Cindy Fife

May 2024

**Idaho National Laboratory
Idaho Falls, Idaho 83415**

<http://www.inl.gov>

**Prepared for the
U.S. Department of Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517**

Design of a Loss of Coolant Blowdown Capsule for Remote Assembly with High Burnup Fuel

K. Anderson*, J. Kahn, C. Jensen, J. Schulthess, A. Fleming, P. Petersen, J. Argyle, C. Fife

Idaho National Laboratory 1955 N Fremont Ave. Idaho Falls, ID 83415 - USA

*Corresponding Author, Klint Anderson, klint.anderson@inl.gov

ABSTRACT

The Transient Water Irradiation System is an enhanced capability capsule type irradiation vehicle designed to support fuel safety research for light water reactor specimens in the Transient Reactor Test Facility at the Idaho National Laboratory. The capsule, as shown in Figure 1, simulates loss of coolant and reactivity-initiated accidents and was designed, deployed, and commissioned with fresh fuel specimens to validate instrumentation and prepare for previously irradiated high burnup specimens. The irradiation system features an extensive in-situ instrumentation package to detect phenomena typical to light water reactor fuels. To accommodate assembly with high burnup specimens inside the Hot Fuel Examination Facility, and to ensure instrumentation integrity is maintained throughout assembly, the design was updated to support remote handling. As shown in Figure 2, the updated design features a hinge mechanism which allows for remote pre-irradiated specimen loading and assembly while protecting sensitive instrumentation. Fixtures and handling equipment have been developed to support remote assembly. The experiment module also includes radiation shielding and contamination control to support operations after removal from the hot cell.



Figure 1. Transient Water Irradiation System

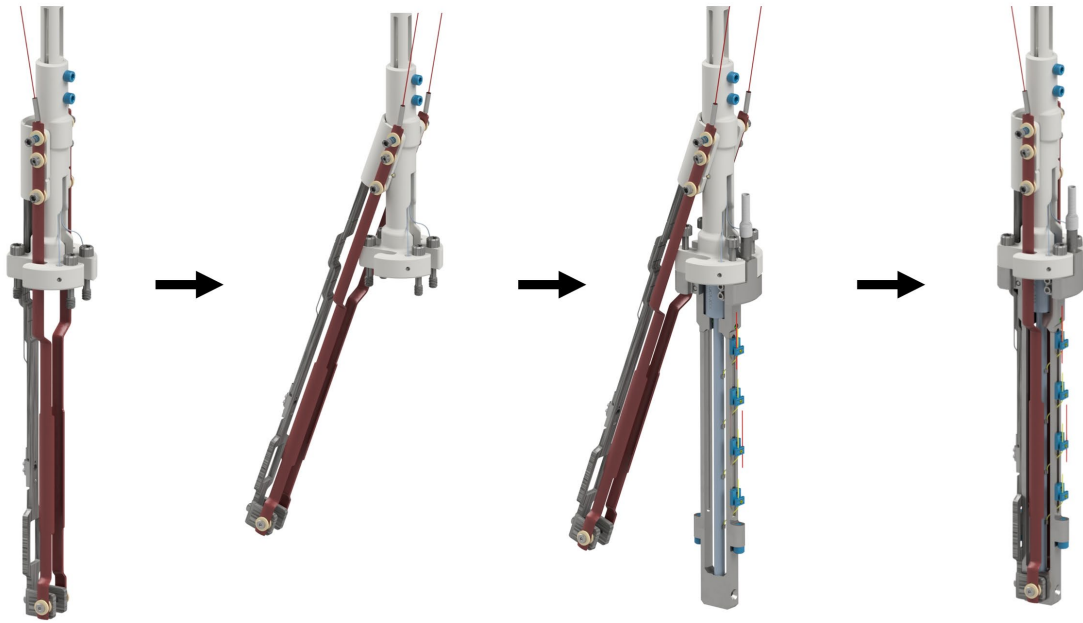


Figure 2. Hinged mechanism for hot cell assembly

Keywords: Loss of Coolant Accident Testing, Transient Reactor Test Facility, Hot Fuel Examination Facility