



Experiment Assembly and Testing in Hot Cell in Support of Advanced Fuels Irradiation Testing

September 2022

Changing the World's Energy Future

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

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In Support of Advanced Fuels Irradiation Testing

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Objective

- Follow-on experimentation of irradiated nuclear fuel is critical to understanding fuel behavior at different stages of the fuel lifecycle. Transient experiments using fuel with high burnup can enlarge understanding of fuel fragmentation, relocation and dispersal under various reactor accident situations. Assembling experiments with such fuel requires remote operations.

Developed Capability

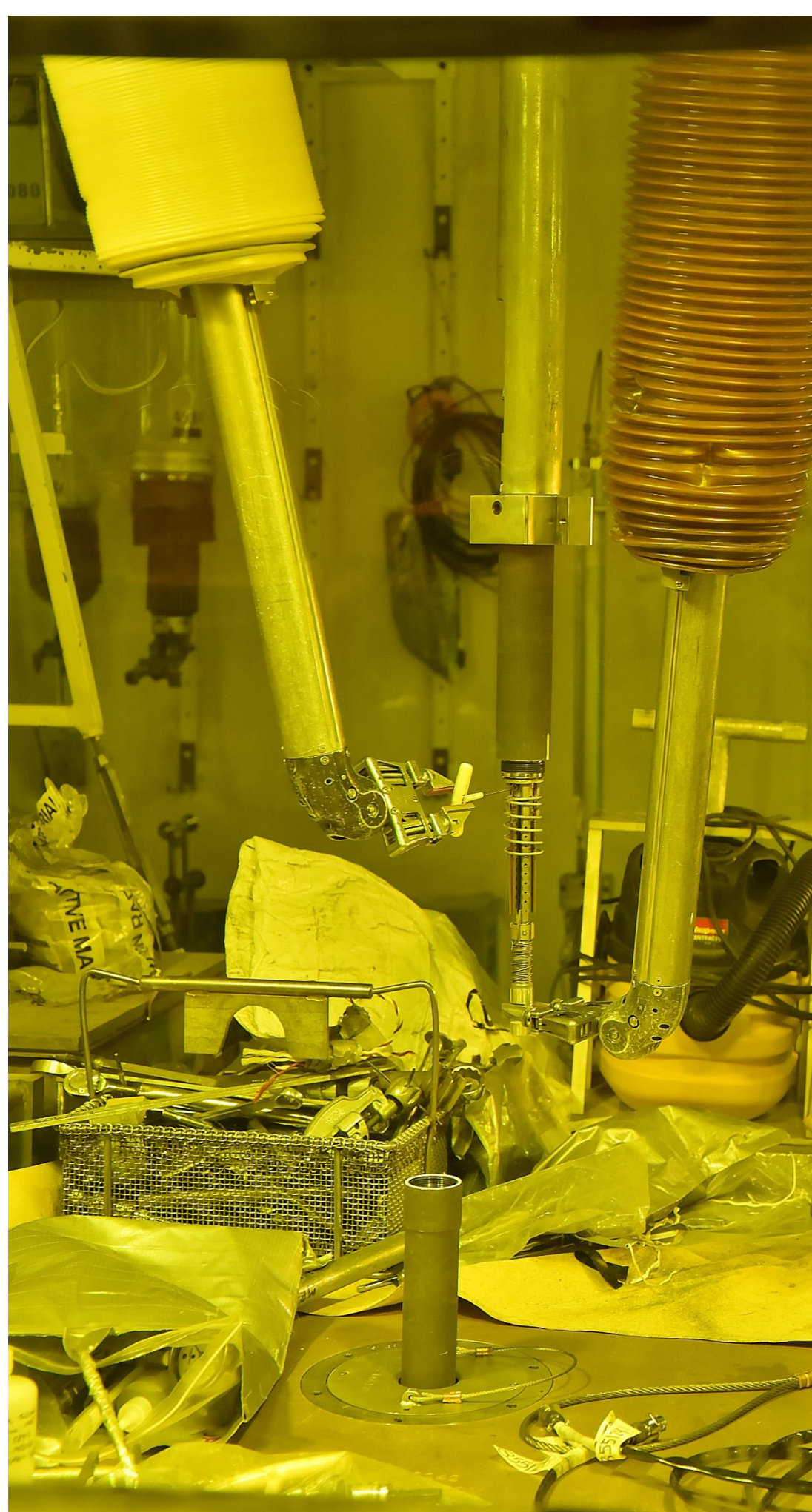
- An irradiated LWR fuel test pin from experiments performed at the Advanced Test Reactor at the Idaho National Laboratory has been assembled into an experiment vehicle with static pressurized water in a hot cell and submitted to testing at the Transient Reactor Test Facility (TREAT).
- Demonstrated capability for the assembly, testing, and verification of integrity for a variety of irradiated fuel experiment assemblies:
 - Development of infrastructure, including worktable, fixtures, electrical, and pneumatic feedthroughs into hot cell.
 - Activation of shielded transport container, including physical modifications and procedure development
 - Development of new processes to control assembly and disassembly
 - Controlled pressurization of the experiment capsule with an out-cell gas bottle
 - Remote operation, verification of in-experiment instrumentation and controls.
 - Performing leak checks on experiment, both remotely and after removal from cell

Future Planned Work

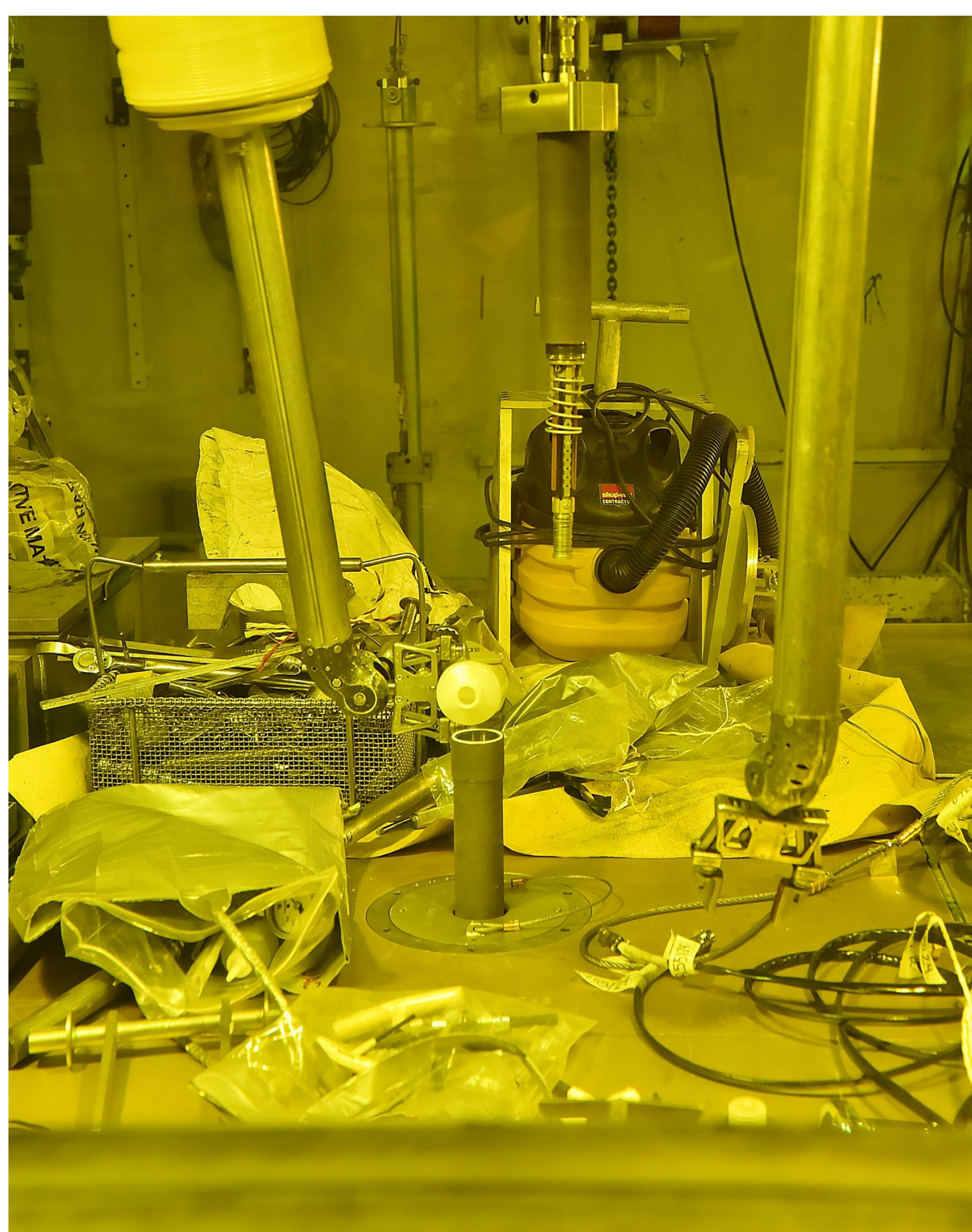
- Follow-on experiments, including tests planned at the Idaho National Laboratory to investigate the effects of pulse width on Pellet Clad Mechanical Interaction (PCMI) failures in high burnup fuel using TREAT.
- Development of capability to handle additional experiment types, including:
 - Static, sodium-filled capsules
 - Blow-down water-filled capsules
 - Flowing sodium loops
 - Flowing water loops
 - Gas-filled capsules
- Development of capability to refabricate and instrument hot fuel rodlets for use in testing



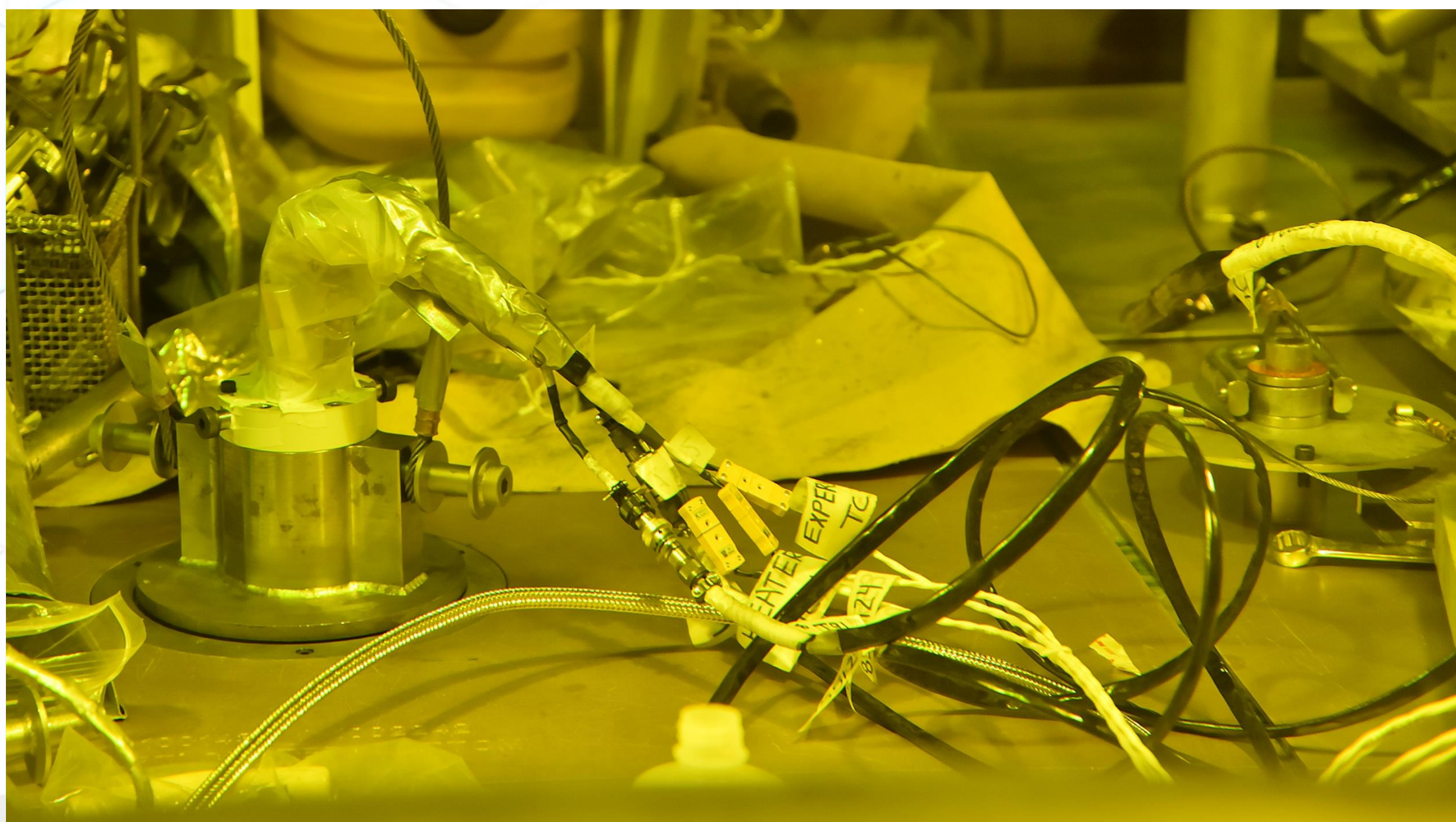
Experiment module prepared for transfer in-cell



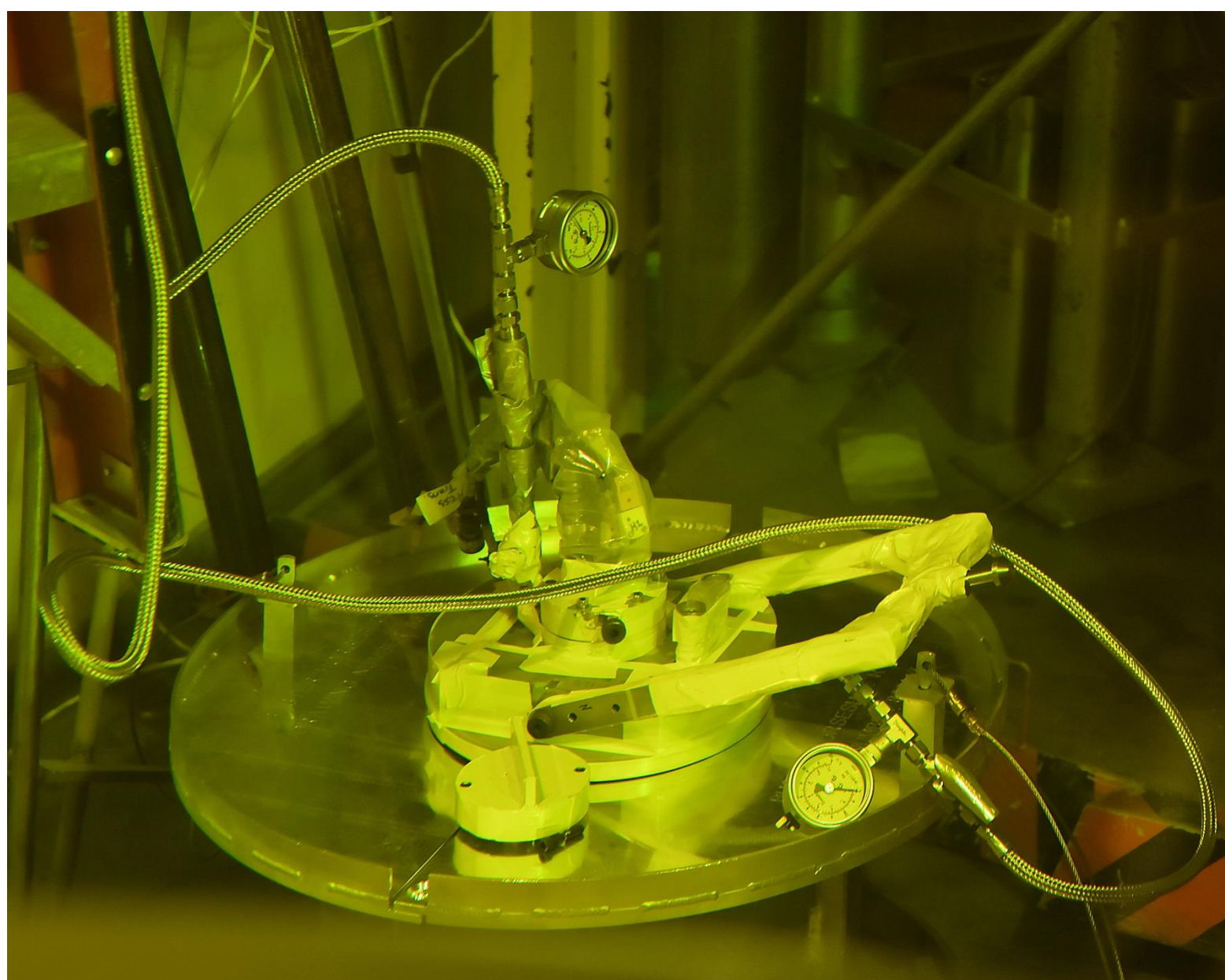
Fuel insertion into experiment capsule at custom worktable



Charging capsule with pre-measured amount of water. Capsule was pressurized after sealing the capsule halves.



Instrumentation checkout and verification in-cell. Capsule leak checking was also performed in-cell.



Pressurization of experiment vehicle at cask port after experiment module insertion



Final checkout in shielded cask, included instrumentation verification through hood and vehicle leak check