News from the Savannah River Site
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Primary Media Contact:
Lindsey MonBarren
Savannah River Nuclear Solutions
803.952.8053
lindsey.monbarren@srs.gov

DOE Media Contact
Julie Petersen
803.952.7690
julie.petersen@srs.gov

For Immediate Release

SRS Partnership Leads to Milestone in Mission to Dissolve Spent Nuclear Fuel

AIKEN, S.C. – (August 8, 2024) – A successful collaboration between Savannah River Nuclear Solutions (SRNS), the managing and operating contractor at the Savannah River Site (SRS), and the Savannah River National Laboratory (SRNL) is advancing progress toward processing non-aluminum spent nuclear fuel (NASNF) as part of the Accelerated Basin De-inventory (ABD) mission.

Spent nuclear fuel stored in the site's underwater storage basin, called L Basin, is either covered, or clad, in aluminum or a combination of zirconium and stainless steel, commonly referred to as NASNF.

To process all remaining spent nuclear fuel in L Basin, which is the goal of the ABD mission, the collaborative team has created the first set of NASNF dissolution flowsheets, which serve as recipes for processing the atypical fuel elements. The flowsheets specify things such as chemical amounts, temperatures and how the material flows through the process.

"Having this first set of plans for processing a portion of the NASNF is a huge accomplishment, taking several years of technology development at SRNL," said James Therrell, Nuclear Materials Program manager for EM contractor Savannah River Nuclear Solutions.

Therrell noted that almost 400 NASNF bundles safely stored in L Basin need to be processed for permanent disposal in the coming years.

"With SRNL's help, SRNS was able to select the first group of NASNF that can be safely processed in the H Canyon chemical separations facility at SRS," he said. "This material will eventually be stabilized in a glass form by the site's liquid waste contractor. We also have set up the rest of the program for success by establishing plans for ongoing technology development to deal with the remaining NASNF."

The makeup of the roughly 400 NASNF bundles varies in content, size and composition, making some of the fuel more challenging to dissolve. Each different type of fuel requires specific flowsheets due to safety requirements.

The site will use an electrolytic dissolver to process the first set of NASNF. “While the aluminum-clad spent nuclear fuel can be chemically dissolved, a relatively easy process involving heating nitric acid to dissolve the aluminum, the zirconium- and stainless-steel-clad fuel is more challenging and must be electrolytically dissolved, adding electricity to the nitric acid dissolution process,” Therrell said.

SRNL performed experiments to overcome challenges for that work, and SRNS developed strategies to prepare the fuel for use in the dissolver.

“SRNL has spent years evaluating and tackling the challenges of processing of NASNF,” said Tam Truong, SRNL researcher. “We have conducted electrolytic dissolution experiments and leveraged processing knowledge and experience to develop the dissolution parameters for the first group of NASNF.”

She continued, “As the process can generate insoluble or undissolved material, we have demonstrated a full-scale jet cleanout system to remove the undissolved material, allowing further dissolution to continue. The ongoing complementary collaboration between SRNL and SRNS strengthens our processing capabilities.”

Therrell concurred, saying, “SRNL developed an impressive residue cleanout prototype that has provided the essential data to allow the processing facilities to finalize equipment designs.”

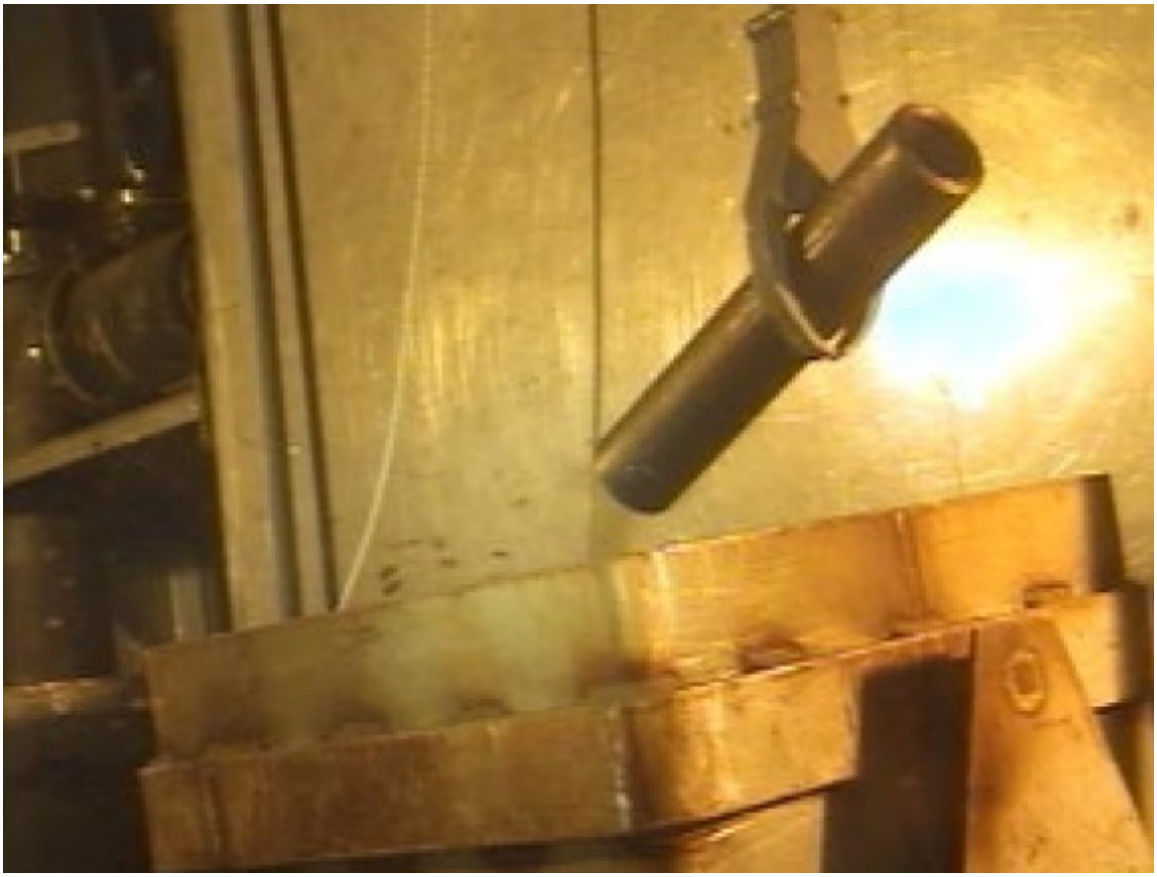
An electrolytic dissolver at H Canyon can support NASNF missions in addition to H Canyon’s standard chemical dissolution capability.

The origin of most NASNF is from historic test reactors, including one from SRS.

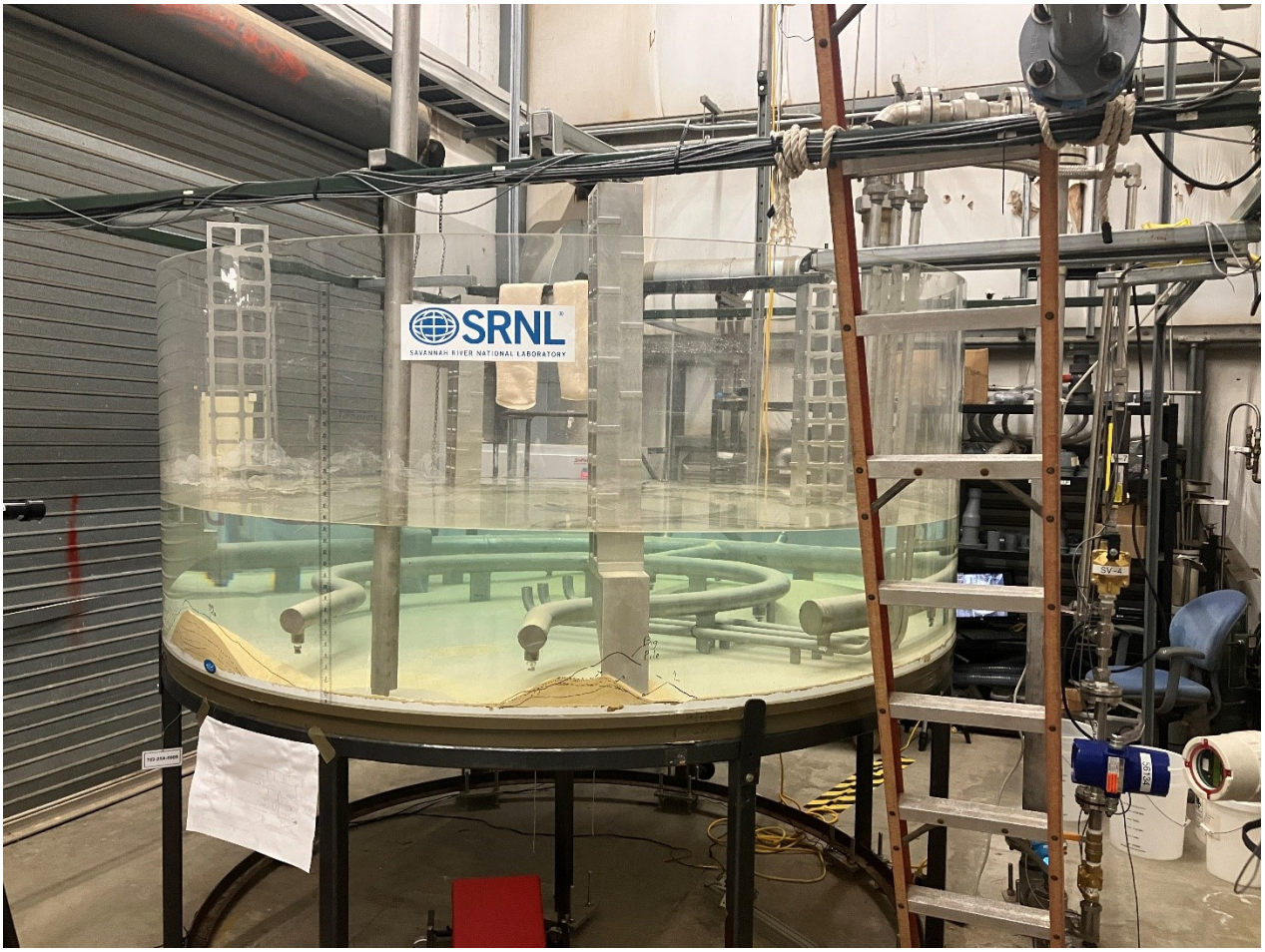
“One of the intriguing aspects of this program is the historical significance of what these unique fuels provided to our country with regards to reactor designs and understanding,” Therrell said. “It feels good to be a part of a team that can help close the loop on these efforts.”

The ABD mission at SRS provides a path for spent nuclear fuel stored in L Basin to be chemically or electrolytically dissolved in H Canyon, and then disposed of through the SRS liquid waste system.

“The collaboration between SRNS and SRNL to make significant progress on a challenging effort is another example of SRS using it’s unique resources to help make the world safer,” said Therrell.



A view of a non-aluminum spent nuclear fuel element.



The mock-up Dissolver Solids Removal System at Savannah River National Laboratory was used to demonstrate a full-scale jet cleanout system to remove undissolved material from the H Canyon electrolytic dissolver, one of the challenges faced for non-aluminum spent nuclear fuel processing.

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