

Research and Development Technical Working Group (R&D-TWG)

Fuel and the Fuel Cycle

Friday, June 12, 2026; 9:00 a.m. to 11:00 a.m. ET

Discussion Summary

Welcome

- The facilitator from Eastern Research Group (ERG), a New York State Energy Research and Development Authority (NYSERDA) contractor, welcomed TWG members, reviewed meeting rules, and asked if any members had follow-up questions from the previous meeting.

Fuel and Fuel Cycle Topic

- Solestiss, a NYSERDA technical contractor, presented an overview of the fuel and fuel cycle topic in the R&D Study. The study identified different R&D needs related to fuel and the fuel cycle for advanced nuclear, the associated risk to deployment, and if there was a role for New York State to support R&D needs.
- TWG members responded to the following electronic polling question: *For any of the following, is the risk to deployment NOT appropriately characterized?*
 - Establishing a reliable high-assay low-enriched uranium (HALEU) supply chain—One disagrees this is a high risk to deployment.
 - Scaling tri-structural Isotropic (TRISO) fuel fabrication and qualification—Two disagree this is a moderate risk to deployment.
 - Metallic fast-reactor fuel development and commercial-scale production—None disagree this is a moderate risk to deployment.
- Extending Gen III+ fuel lifetime through accident tolerant fuel (ATF) and low-enriched uranium above 5% (LEU+) pathways—One disagrees this is a low risk to deployment.
 - Advanced fuel qualification acceleration and high-fidelity fuel performance simulation—Six disagree this is a low risk to deployment.
 - Used fuel management and disposal pathways for non-oxide spent fuels—Six disagree this is a moderate risk to deployment.
 - Evaluating long-term reprocessing options and safeguards—Three disagree this is a low risk to deployment.
 - Exploring alternatives to uranium mining—None disagree this is a low risk to deployment.
- TWG members provided further feedback on the two R&D needs members most disagreed with:

- Regarding the R&D need for advanced fuel qualification acceleration and high-fidelity fuel performance simulation having a low risk to deployment, TWG members said:
 - National labs working with Gen IV reactors on their qualification process often find deviations from original fuel specs.
 - National labs and New York State entities can partner to advance fuel fabrication and characterize advanced fuels, accelerating the understanding of novel fuel design.
 - Both fuel qualification acceleration and high-fidelity simulation are critical.
- Regarding the R&D need for used fuel management and disposal pathways for non-oxide spent fuels having a moderate risk to deployment, TWG members said:
 - While this is important, some Gen IV reactors have 20-year cycles, so it isn't as high on the priority list as more time-pressing needs.
 - On the other hand, disposal should be studied and understood now, not kicked down the road, or we could end up going down a route that has less favorable outcomes with respect to fuel waste.
 - The topic is important because reactor developers may not press forward on addressing this issue without government pushing forward.
- TWG members responded to the following electronic polling question: *Which R&D needs does New York State have high potential to support?*
 - There were zero votes for establishing a reliable HALEU supply chain, two votes for scaling TRISO fuel fabrication and qualification, two votes for metallic fast-reactor fuel development and commercial-scale production, two votes for used-fuel management and disposal pathways for non-oxide spent fuels, three votes for extending Gen III+ fuel lifetime through ATF and LEU+ pathways, six votes for advanced fuel qualification acceleration and high-fidelity fuel performance simulation, three votes for evaluating long-term reprocessing options and safeguards, and zero votes for exploring alternatives to uranium mining.

Fuel Availability and Qualification

- Solestiss reviewed R&D needs identified around fuel availability and qualification. TWG members were asked to consider whether there are R&D opportunities outside of those opportunities that would require infrastructure unavailable in New York State such as modeling or AI.
- TWG member feedback:
 - Some TWG members felt that the main issues around developing TRISO are not scaling or ability but rather cost relative to other fuels.
 - TRISO also produces a large volume of spent nuclear fuel (SNF) that is inefficient to recycle.

- Other TWG members suggested that New York facilities could participate in R&D for TRISO by offer testing and/or modeling and building up the infrastructure for testing metallic fuel.
 - However, development companies would not invest in new technologies until cost competitiveness is studied and demonstrated to be viable.

Fuel Reprocessing

- Solestiss reviewed R&D needs for fuel reprocessing. Currently, spent fuel is stored in casks on-site at facilities. A closed fuel cycle would allow for extracting energy and accessing radio isotopes in spent fuels for use in other industries. TWG members were asked to provide insights on both technical feasibility and socioeconomic issues related to fuel reprocessing.
- TWG member feedback:
 - Reprocessing requires a hot-cell facility, which doesn't currently exist in New York State.
 - Fast reactors are more likely eligible for recycling because thorium uses a different fuel cycle. There is currently no economic driver for it, even though thorium is more abundant.
 - When it comes to sodium-cooled reactors, the sodium is difficult to distill out of fuel.
- Further research related to TRISO could continue to look for opportunities for reprocessing, though there is a high level of uncertainty that such research would be fruitful.
 - Recycling of mixed-oxide fuels was explored in the early 2000s, but it was not fully completed and presents more opportunity for R&D.
 - Co-location versus off-site reprocessing has been studied, and the benefits depend on the specific relevant data and assumptions.

Fuel Waste Disposal

- Solestiss shared the R&D needs around fuel waste disposal. TRISO has graphite, and that increases the volume and disposability of waste. Transportation of HALEU fuel requires research to demonstrate safety.
- TWG member feedback:
 - Salt is important for TRISO and metallic fuel. More research needs to be done on permanently immobilizing these materials.
 - There is not a storage/transportation issue for spent HALEU.

Transportation Demonstration

- The Nuclear Innovation Alliance, a NYSERDA contractor, reviewed the current status of SNF across New York State. The federal government is working on permanent storage options, and once those are identified, SNF will need to be transported to those sites.

NYSERDA is considering a fuel transportation demonstration to look at the needs for safe transportation of SNF.

- TWG member feedback:
 - Could there be opportunities related to the new Atlas railcar system?
 - A demonstration could start with transportation within New York State, then expand to interstate transit, focusing on the government processes needed.
 - Nuclear has usually been shipped by rail. The containers are designed for extreme accidents and acts of sabotage.
 - Another option is maritime transport, possibly around the Great Lakes.
- There is no more SNF at the West Valley Demonstration Project (WVDP), but there is vitrified high-level waste from the 1960s and 1970s that is managed by the U.S. Department of Energy and could be considered for the shipping demonstration.
 - There is ongoing research on licensable shipping containers for metal fuel.
 - Working with the public is important for a successful demonstration.
- A previous demonstration at DOE focused on the impact of vibrations on a storage casks due to different shipping methods. As part of its demonstration, New York State could consider a similar analysis.
- New York State could also consider demonstrating the value of consolidated interim storage, which involves taking fuel from multiple sites and consolidating it to one location.
- TWG members also discussed the relative quantities of waste from advanced reactors and insights on how TRISO volume could impact disposal.
- TWG member feedback:
 - Metal fuel volumes are smaller than other fuels due to their high uranium density but can be more chemically reactive (i.e., less stable) than oxide fuels.
 - Although the specific details are proprietary information, the size and density of fuel can be estimated through analyzing the reactor type and power.
 - Metal fuels are better for recycling. Light water reactor fuels are established and well known. TRISO has ultra-conservative containment but is harder to recycle.
 - The volume of graphite waste is a problem. TRISO fuel forms are graphite moderated. There are currently 160,000 tons of TRISO fuel from graphite reactors in temporary storage.

Action Items and Next Steps

Task	Assigned to	Target date
Publish Meeting #4 summary notes.	ERG	July 29
Provide agenda and read-ahead for next meeting.	ERG	July 2
Prepare for and attend wrap-up meeting.	TWG members	July 9

Participants

Member Organizations

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Columbia University
Cornell University
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Idaho National Laboratory
Oak Ridge National Laboratory
Rensselaer Polytechnic Institute
Rochester Institute of Technology
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