



Savannah River  
National Laboratory®

A U.S. DEPARTMENT OF ENERGY NATIONAL LAB • SAVANNAH RIVER SITE • AIKEN, SC • USA

# SRNL HTGR Technology Maturation Cost Estimate

**R. A. Pierce**

March 21, 2022

SRNL-RP-2022-00224

Based on the state of the technology development of vapor-phase graphite digestion for the processing of HTGR fuel, the next goal for technology maturation is to demonstrate an optimized and integrated engineering-scale system. Technology maturation to a technology readiness level (TRL) of 6 constitutes Phase 1 of the overall project. Validations will be completed using non-radioactive simulants whose critical components are subsequently confirmed by tests conducted with unirradiated fuel pebbles and irradiated fuel kernels. Variations of the equipment downstream of the digestion system will be based on the end state of the fuel, but the development requirements for the digestion process remain relatively unchanged. Integration of technology elements upstream and downstream of graphite digestion must also be demonstrated. The technology development has been broken down into a preliminary task and seven major activities, each a significant development or support effort.

A preliminary sequencing of activities is provided below. The actual timing and realization of costs will be contingent upon funding profiles, staff availability, and progression of the technology maturation.

Activity	Description	FY 22		FY23				FY24				FY25			
		3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
0	Task Plan														
1	Baseline														
2	Remote Ops														
3	Unirr Fuel														
4	Irrad Fuel														
5	Integ Demo														
6	Cask Handle														
7	Periodic TRAs														
8	Phase 2 Estimate and Schedule														

The estimated costs for each activity are listed below. If maturation proceeds without significant issues, the realized costs could be lower. This estimate compares favorably to a technology maturation estimate of \$51.8 M provided in 2015 (\$58.3 M when escalated to 2022).

Activity	Description	Est. Cost (\$M)
Pre	Approved Task and Technology Maturation Plan	0.6
1	Establish Engineering-Scale Baseline Process Conditions and System Design	8.1
2	Demonstrate Process Rates and Design for Remote Operation and Maintenance	8.4
3	Unirradiated Fuel Demonstrations	3.4
4	Irradiated Fuel Kernel Demonstrations	2.3
5	Integrated Engineering-Scale Demonstration	8.6
6	Remote Cask Handling and Pebble Delivery	5.8
7	Periodic TRAs, Other Technology Reviews, Travel	2.2
8	Provide Phase 2 Estimated Cost and Schedule	1.2
9	Support Functions	7.0
	Sub-Total	47.6
	3% DOE Admin	1.4
	Total	49.0

Assuming the project starts in April 2022, expenditures by BSRA fiscal years is as follows, including the DOE Administrative Fee. Deviations from the cost schedule will impact the Phase 1 schedule. BSRA will assess the impacts of any deviations and communicate these to JEN.

Year	FY22	FY23	FY24	FY25	Total
Est Cost	\$5.9 M	\$20.0 M	\$14.5 M	\$8.6 M	\$49.0 M
Request	\$12.1 M	\$13.8 M	\$14.5 M	\$8.6 M	\$49.0 M