GA-A23811

GT-MHR COMMERCIALIZATION STUDY

Technical Progress and Cost Management Report for the Period
May 1 through May 31, 2003

by
GT-MHR Staff

Contact: A. S. Shenoy

Prepared under
Oakland Operations Office
Program DE-AC03-01SF22343
for the U.S. Department of Energy

General Atomics Project No. 30103
DATE PUBLISHED: June 2003

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**GT-MHR Commercialization Study
Monthly Technical Progress and Cost Management Report
for May 2003**

Contract No. DE-AC03-01SF22343
Submitted to: DOE - Oakland Operations Office
By: General Atomics

PART 1 – Technical Progress

Summary

- Petten advised GA the start of the HFR-EU2 irradiation is being delayed until late July 2004. HFR-EU1 (pebble fuel) is also delayed until February/March 2004. The reason for the delays was implementation of new financial regulations at Petten that delayed the contracts for capsule fabrication.
- Review of the MHR-2 Fuel Product Specification was completed. Revision of the specification to incorporate the review results is in progress.
- Detailed test matrices have been drafted for capsule irradiation tests and for post-irradiation heating tests proposed for development and qualification of advanced coated-particle fuels capable of meeting anticipated VHTR fuel performance requirements.

Task 1 – Fuel Irradiation

Dr. M. Fuetterer from Petten in The Netherlands has advised GA the start of the HFR-EU2 irradiation was delayed until late July 2004. He indicated that HFR-EU1 (pebble fuel) was also delayed. The reason for the delays was implementation of new financial regulations at Petten that delayed the contracts for capsule fabrication.

Dr. Fuetterer said Petten had contracted with an outside (but on-site) firm to construct the capsules and the priority associated with capsule construction conflicted with higher-priority commercial work. This firm apparently does not have sufficient experienced capsule fabricators to accomplish the HFR-EU2 capsule fabrication any earlier. Dr. Fuetterer is trying to convince the subcontractor to supply the capsules earlier but he has no commitments as yet.

According to Dr. Fuetterer the overall Petten gas-reactor capsule irradiation schedule is now as follows.

1) January 2004: HFR-EU-1 bis, high-burnup fuel pebbles irradiated without

sweep gas monitoring that will supply high burnup spheres for PIE heatup testing at Karlsruhe. This test is on GLE-4 type German spheres from AVR reload 21 with 17% U235 enrichment. This test was originally scheduled to begin in July 2003.

2) February to March 2004: HFR-EU1 test to begin with sweep gas monitoring; this test irradiates German and Chinese fuel spheres and will serve to checkout the sweep gas system for HFR-EU2. This test was originally scheduled to begin in October 2003.

3) July 2004: HFR-EU2 test with sweep gas system; this test will confirm that U. S. compacts, made with German fuel particles from a batch that previously showed satisfactory irradiation performance, can be successfully irradiated to full GT-MHR burnup. This test was to begin in December 2003.

The graphite sleeves for HFR-EU2 have not yet been machined, but this work is scheduled soon. We agreed to send Dr. Fuetterer the dimensional change data we have on the compacts and H-451 graphite to allow him to select the compact-graphite holder gap width. The data for this task has been assembled but the data has not yet been sent to Petten.

Proposals for fuel work for the next EU framework are due in the summer of 2003. Dr. Fuetterer believes that proposals will include PIE and heating of EU2 compacts. Approval of the next framework proposals is scheduled for October 2003. Dr. Fuetterer will keep us informed.

Task 2 – Fuel Manufacturing Process Improvement

This task has been completed.

Task 3 – NRC Interaction

This task is not currently funded.

Task 4 – Plant Cost Evaluation

This task has been completed.

Task 5 – Waste Disposal Assessment

This task has been completed.

Task 6 – Project Management and Project Development

This task covers all of the commercialization study project management and project development activities. During May, routine reviews of project activities were performed and the monthly report for April was prepared.

Task 7 – DOE Fuel Plan

This task has been completed.

Task 8 – MHR-2 Fuel Specification

All review comments have been received on the MHR-2 Fuel Product Specification, comment resolutions developed and comment resolutions accepted. We are currently revising the specification to include the agreed resolutions.

Task 9 – This task number not currently used***Task 10 – Advanced Fuel Studies***

Detailed test matrices have been drafted for capsule irradiation tests and for post-irradiation heating tests proposed for development and qualification of advanced coated-particle fuels capable of meeting anticipated VHTR fuel performance requirements. In effect, these test matrices define the scope of the "Plan for Screening Irradiations" (due July 15, 2003); these matrices along with the process development and the fission product transport tasks constitute the overall scope of the umbrella "Development Plan for Advanced High Temperature Coated-Particle Fuels" (due July 31, 2003).

As described previously, it is assumed this advanced fuel program is an incremental program with the AGR fuel development program providing the base technology. The strategy is to place initial emphasis on UO₂* and ZrC development; early screening tests will determine their adequacy for VHTR applications. Development of more "exotic" particle designs would follow as necessary.

A list of fuel/fission product Design Data Needs (DDNs) for the VHTR was developed earlier, and the subset of these DDNs which would be addressed by this advanced fuel program was identified. Nine irradiation tests, using the multi-cell capsule being designed by the AGR program, and 47 postirradiation heating tests were defined to satisfy these VHTR DDNs. The first two irradiation capsules and the first series of heating tests would be screening tests of TRISO-coated UO₂* (conventional UO₂ kernel with a thin ZrC overcoat) and of TRISO-coated (ZrC replacing SiC) UCO. On the basis of the test results, one of these particles

would be chosen as the reference, and subsequent tests would focus on qualifying the reference particle and on validating the associated design methods for predicting its performance.

On the occasion of the ANS National Meeting in San Diego, Buzz Savage, AFCI program manager, and Madelene Feltus, AGR program manager, visited GA on June 2, 2003, and were briefed on the status of the current work and on proposed follow-on work in FY04.

Task 11 – VHTR Materials Survey

This task has been completed.

Part 2 - Cost Management

Item	Total Expenditures, K\$	
	May 2003	Inception to Date ¹ , Totals
Task 1 – MHR-1 Fuel Irradiation	2.5	144.5
Task 2 – Fuel Manufacturing Process Improvement	0.0	204.0
Task 3 – NRC Interaction	0.0	143.8
Task 4 – Plant Cost Evaluation	0.0	87.3
Task 5 – Waste Disposal Assessment	0.0	103.2
Task 6 – Project Management and Development	0.4	139.2
Task 7 – DOE Fuel Plan	0.0	140.6
Task 8 – MHR-2 Fuel Specification	5.9	47.5
Task 10 – Advanced Fuel Plan	22.6	105.2
Task 11 – VHTR Materials Survey	0.0	22.8
Totals	31.4	1,138.1

Note:

1. Work started June 18, 2001.