

GA-A23811

GT-MHR COMMERCIALIZATION STUDY

Technical Progress and Cost Management Report for the Period
March 1 through March 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: April 2003

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

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

PART 1 – Technical Progress

Summary

- Work on the HFR-EU2 pre-irradiation data report is now approximately 90% complete. A report section has been added containing pre-irradiation data on the Great Lakes Carbon Company graphite to be used in the test.
- The outline for the Advanced Coated Particle Fuel Development Plan was completed and an extensive literature survey of high-temperature, coated-particle fuels was conducted.

Task 1 – Fuel Irradiation

Work continued on preparation of the Pre-Irradiation Report for the HFR-EU2 irradiation test. The Pre-irradiation Report is now approximately 90% complete. We added a section to the report on the Great Lakes Carbon Company graphite to be used in the test. This graphite will be machined by the Petten capsule fabricator to hold the ten compacts to be tested in this irradiation. Both the graphite and the compacts were sent to the Petten and arrived there in January 2003. The HFR-EU2 test is currently scheduled to begin irradiation sometime in the fourth quarter of 2003.

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 March, routine reviews of project activities were performed and the monthly report for February was prepared.

Task 7 – DOE Fuel Plan

This task has been completed.

Task 8 – MHR-2 Fuel Specification

During March, only a small amount of effort was devoted to work on the MHR-2 fuel specification.

Task 9 – This task number not currently used

Task 10 – Advanced Fuel Studies

The scope of this task is to prepare a draft plan for the development of advanced coatings to enable core outlet coolant temperatures above 850 °C in High Temperature Gas-Cooled Reactors (HTGRs) to expand their commercialization potential and to support GEN IV program objectives. The latter objective emphasizes the development of advanced fuel systems for Very High Temperature Reactors (VHTRs) with core outlet temperatures of ≥ 1000 °C for highly efficient electricity production and for process heat applications, including nuclear hydrogen production.

The outline for the Advanced Coated Particle Fuel Development Plan was completed. An extensive literature survey of high-temperature, coated-particle fuels was conducted. Findings were related to various ZrC and combination coatings with ZrC, getter additives to kernels and coatings to control oxygen potential inside the particles, and other advanced coatings such as titanium and niobium nitrides.

In preparation for the report on screening tests of advanced coated particle fuels, the amount of zirconium introduced into the core for three types of zirconium carbide fuels was calculated. 1) For the PuO_2^* , TRISO-coated plutonium oxide kernels with a thin pyrocarbon buffer layer and a thin ZrC layer, the number of atoms of Zr in the particle is about 4% of the number of Si atoms in the particle. 2) For the particle with zirconium carbide co-deposited with porous pyrocarbon in the buffer, the number of Zr atoms present are about 3% of the number of atoms

of Si present. 3) For the particle where a Zirconium Carbide layer is substituted for the Silicon Carbide layer (sometimes called TRIZO), the number of atoms of Zr is about the same as the number of atoms of Si in a conventional TRISO particle.

Task 11 – VHTR Materials Survey

This task has been completed.

Part 2 - Cost Management

Item	Total Expenditures, K\$	
	March 2002	Inception to Date ¹ , Totals
Task 1 – MHR-1 Fuel Irradiation	4.8	136.7
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	0.1	138.4
Task 7 – DOE Fuel Plan	(0.7)	140.6
Task 8 – MHR-2 Fuel Specification	4.2	37.1
Task 10 – Advanced Fuel Plan	38.5	66.8
Task 11 – VHTR Materials Survey	(2.5)	22.8
Totals	44.4	1,080.7

Note:

1. Work started June 18, 2001.