

GA-A23811

GT-MHR COMMERCIALIZATION STUDY

Technical Progress and Cost Management Report for the Period
August 1 through August 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: September 2003

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Table of Contents

	<u>Page</u>
Part1 - Technical Progress	1
Summary	1
Task 1 - Fuel Irradiation	1
Task 2 - Fuel Manufacturing Process Improvement	1
Task 3 - NRC Interaction	2
Task 4 - Plant Cost Evaluation	2
Task 5 - Waste Disposal Assessment	2
Task 6 - Final Report and Recommendations for Further Development Activities	2
Task 7 – DOE Fuel Plan	2
Task 8 – MHR-2 Fuel Specification	2
Task 10 – Advanced Fuel Plan	2
Task 11 – VHTR Materials Survey	3
Part 2 - Cost Management	4

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

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

PART 1 – Technical Progress

Summary

- In the process of fabricating the MHR-1 irradiation test capsule, Petten has advised that three thermocouples (out of 24) and the Self Powered Neutron detector were damaged during high temperature brazing with the upper capsule lid. Procurement of new TCs and SPN is in process but there will be a delay in the irradiation test of about nine weeks. Startup of the irradiation is now projected to be July or August 2004.
- In preparation for performing the nuclear design analysis activities required by the advanced fuel studies task, a complete 3-D nuclear design analysis is first being performed of the GT-MHR reference design. This will serve as the baseline for studies of the advanced fuel nuclear design performance.

Task 1 – Fuel Irradiation

Petten personnel have advised us that during high temperature brazing of the thermocouples (TCs) and self-powered neutron detectors (SPNs) with the upper capsule lid, three thermocouples (out of 24) and the Self Powered Neutron detector were damaged (attack by the brazing material with consecutive loss of electric insulation). A repair was attempted but failed, so Petten has ordered new TCs and an SPN. Petten will try and find the cause for this. One reason may be changes in the material or thickness of the TC sleeves (Petten will do some micrographs). Some further brazing tests with the broken TCs will be done. The procedure as such was identical to previous assemblies and can be excluded as the cause. A delay on the order of 9 weeks is projected. This will mean the startup of HFR-EU2 will be delayed until about July or August 2004.

I-NERI funding in CY-04 for continuation of this task is still pending.

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

Task 7 – DOE Fuel Plan

This task has been completed.

Task 8 – MHR-2 Fuel Specification

This task has been completed.

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

In preparation for performing the nuclear design analysis activities required by this task, a complete 3-D nuclear design analysis is being performed of the GT-MHR reference design. Although a complete 3-D nuclear design was performed for the GT-MHR reference design back in 1995, the majority of the files generated during the calculations no longer exist in the GA computer archives. Therefore, the initial task is to re-develop the analysis approach and methodologies needed to perform the nuclear design work.

To date, 2-D calculations of the GT-MHR reference design have been performed through the equilibrium cycle (cycle 5). This required generation of input files and running of the following GA codes: MICROX; MHR_DENS; HELP; and GAUGE. The only data not generated from scratch include control rod and RSC microscopic cross sections, their respective concentration-dependent self-shielding factors, and self-shielding factors for U-238 and B-10 nuclides, which were found in the archives. Other pieces of data required in MICROX and GAUGE were also found and applied. Both 50-day and 10-day GAUGE time

steps were re-developed. Their sub-hex radial power peaking data was compared to the published 1995 reports. The results compared very well with the 1995 results.

In an attempt to minimize peaking, calculations are being performed for a layer-placement refueling scheme, splitting both the top and bottom half of the core into a single reload segment. This type of scheme requires all nuclides to be depleted on a per segment basis – a method not used in the previous GAUGE calculations. Therefore, a new nuclide depletion sequence was included in the input files already generated for this design.

Although the auxiliary codes MHR_DENS, HELP, PLACE1, and GAUGE-AX, do assist the user in generating detailed 2-D atom densities required for GAUGE, the process can still be very tedious and error prone. Many of the design assumptions are also hard-coded into MHR_DENS. This calculation process is being converted into a user-friendly Excel Spreadsheet to save time in editing the auxiliary code input file data by hand and is expected to lead to improved design optimization options.

Task 11 – VHTR Materials Survey

This task has been completed.

Part 2 - Cost Management

Item	Total Expenditures, K\$	
	August 2003	Inception to Date ¹ , Totals
Task 1 – MHR-1 Fuel Irradiation	0.8	150.9
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	0.9	141.0
Task 7 – DOE Fuel Plan	0.0	140.6
Task 8 – MHR-2 Fuel Specification	0.8	56.7
Task 10 – Advanced Fuel Plan	28.4	179.3
Task 11 – VHTR Materials Survey	0.1	22.9
Totals	31.0	1,229.7

Note:

1. Work started September 18, 2001.