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Mr. Walter A. Simon
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San Diego, CA 92121-1122

**SUBJECT: PLANS FOR GAS TURBINE-MODULAR HELIUM REACTOR
PREAPPLICATION INTERACTIONS (PROJECT NO. 716)**

Dear Mr. Simon:

Thank you for recent letters regarding preapplication activities for the Gas Turbine-Modular Helium Reactor (GT-MHR), specifically Dr. Arkal Shenoy's letter involving General Atomic's (GA) plan for preapplication dated February 18, 2002, and Laurence Parme's letter providing comment on SECY-01-0207, "Legal and Financial Issues Regarding Exelon's Pebble Bed Modular Reactor" dated April 8, 2002. This correspondence has been beneficial in developing our preapplication plan.

On March 29, 2002, I sent a letter to GA indicating that the NRC intends to use a preapplication process similar to the one used for the Pebble Bed Modular Reactor (PBMR) to perform the preapplication review of the GT-MHR. Although a SECY paper will not be issued for the GT-MHR preapplication, the Commission was notified of the intent to proceed with the GT-MHR preapplication review. As a follow-up to our March 29, 2002 letter to Dr. Arkal Shenoy, this letter provides a focused approach to review your preapplication along with additional insight into the resources needed for preapplication review and potential technical issues regarding the GT-MHR design.

It is our understanding that the preapplication review of the GT-MHR will build on the Fort St. Vrain high temperature gas-cooled reactor (HTGR) license, and more directly, the Modular High-Temperature Gas-Cooled Reactor preapplication review. Consequently, many GT-MHR preapplication issues are similar to issues documented in NUREG-1338, "Draft Preapplication Safety Evaluation Report for the Modular High-Temperature Gas-Cooled Reactor."

NRC and GA preapplication activities may need to be adjusted to support any changing needs, financial commitments, and schedules. Issues should be identified soon, to allow for discussions and any needed accommodations. GA should revise their proposed preapplication schedule based on an anticipated level of commitment and available funding. Once a more definite schedule is determined, meetings will be established to address key technical areas and associated issues. The level of DOE funding for generic issues related to HTGRs that also relate to the GT-MHR will need to be factored into the revised preapplication schedule. We also believe that a well-focused preapplication review can help reduce the resource requirement.

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We look forward to the opportunity to proceed with your preapplication. Please contact Ronald Lloyd of my staff (Project Manager, GT-MHR at 301-415-7479) if you have any questions regarding the attached GT-MHR preapplication plan and proposed schedule.

Sincerely,

Farouk Eltawila, Director
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

Attachment: As stated

W.Simon

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Farouk Eltawila, Director
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NRC's GAS TURBINE-MODULAR HELIUM REACTOR (GT-MHR) PREAPPLICATION PLAN AND PROPOSED SCHEDULE

BACKGROUND:

By letter dated March 22, 2001, General Atomics Company (GA) requested to meet with the NRC to begin exploratory discussions on the licensing of the GT-MHR. On December 3, 2001, the staff met with representatives from GA and the Department of Energy (DOE) in a public meeting to discuss preapplication activities. In this meeting, GA stated their desire to license a GT-MHR in the U.S., capitalizing on their previous modular high temperature gas-cooled reactor experience and a current project (under DOE sponsorship) to build a GT-MHR in Russia for plutonium disposition. GA discussed its approach to licensing the GT-MHR and provided a draft schedule for completing preapplication activities. As agreed in the December 3, 2001 meeting, GA followed up with a letter dated February 18, 2002, that described in more detail their desired plan and schedule for preapplication activities. Based on this letter, GA has proposed that the preapplication phase be completed by December 2003. However, the NRC estimates that the preapplication phase will take approximately 21 months (from the initiation of technical exchange with GA) to complete, which will extend our review beyond December 2003.

The design of the GT-MHR is based upon a design currently being developed jointly by the U.S. and the Russian Federation (under DOE sponsorship) for disposition of weapons grade plutonium. It has been stated that, with the exception of the fuel, the commercial version of the GT-MHR will be essentially identical to the design, which may be built in Russia. Insights from this project could enhance the preapplication review.

The GT-MHR preapplication activities will build upon previous preapplication reviews. For example, many of the technical issues associated with the Pebble Bed Modular Reactor (PBMR), also apply to the GT-MHR since both designs are advanced high temperature gas-cooled reactors (HTGR). It should be noted however, that Exelon's announcement that it will not proceed with the PBMR project beyond the completion of the current feasibility study phase, will leave open many important technical issues. Those with generic implications will be addressed as part of the HTGR technology assessment activities being conducted for DOE under a reimbursable agreement, as well as a number of interactions with domestic and international organizations with HTGR experience. Although much of the information contained in SECY-01-0207, "Legal and Financial Issues Related to Exelon's Pebble Bed Modular Reactor (PBMR)" will apply to the GT-MHR, early termination of the PBMR preapplication review will introduce a larger degree of uncertainty into the resolution of technical issues.

The GT-MHR preapplication work will help to identify the need for new regulatory requirements that are different from current light water reactor (LWR) regulatory requirements. The GT-MHR preapplication activities will include (1) a preliminary assessment of GT-MHR technology and safety, and (2) a preliminary assessment of GA's proposed approach to licensing and issue resolution. The intent is not to duplicate work that has already been completed in the PBMR preapplication phase that is applicable to the GT-MHR, but rather to build upon this work as much as possible.

The staff will continue interactions with DOE on generic HTGR technology assessment as described in SECY-01-0070. That work examines the design and the safety basis for HTGRs

from a generic perspective. The assessment includes key analytical tools and data relevant to safety assessments of HTGR reactors. This work will provide the NRC staff with expertise and capabilities needed to conduct a future licensing review of an HTGR. The staff will:

- conduct early interactions with DOE on the NRC preliminary technology assessment scope and content to meet both NRC and DOE needs
- familiarize a nucleus of staff with the design and technology of HTGRs and their approaches to safety
- assess analytical tools and establish an independent staff capability to quantitatively assess the safety performance of HTGRs
- identify key generic technology issues and safety implications, including research needs to address these issues

DISCUSSION:

This preapplication plan is divided into five major sections: Technology Assessment, Regulatory Requirements and Process, Conduct of Interactions and Documentation, Communication and Coordination, and Resources and Schedule. The outcomes of technology assessment and regulatory requirements and process activities will be the identification of key policy and safety issues, including preliminary guidance for the staff and potential applicants, sufficient to establish expectations for licensing.

Technology Assessment

These activities include (1) familiarization with design, safety, fuel cycle, and research issues, and (2) identification of safety and policy issues. Each of these activities is discussed below.

- **Familiarization with Design, Safety, Fuel Cycle, and Research Issues**

Initial staff efforts will be directed toward becoming familiar with the GT-MHR design, to the extent needed to assess major technical issues, safety, and research needs. This will be accomplished first through discussions and interactions with GA on selected topics and by consideration of previous HTGR experience. An initial meeting held with GA on December 3, 2001, to discuss the GT-MHR design, safety issues, and GA's proposed schedule and approach for preapplication interactions included five main areas; (1) programmatic and process topics, (2) licensing approach, (3) technology development (e.g., fuel, graphite, and metals), (4) design description, and (5) accident analyses.

- **Identification of Safety and Policy Issues**

HTGRs, such as the GT-MHR, involve characteristics that make their approach to protecting public health and safety different from the LWR designs currently licensed in the U.S. Consequently, there is a need to identify and propose resolution pathways for key GT-MHR safety and technology issues. For example, the HTGR approach to safety results in a shift in emphasis from mitigation features to highly reliable protection

features. High reliability and protection is generally attributed to fuel capable of withstanding high temperatures, a simple passive decay heat removal system, and a passive reactor shutdown process, rather than through active standby engineered safety systems. Mitigation is provided through different concepts for fission product containment and through long response times of the reactor in the event of an accident.

Regulatory Requirements and Process

It is expected that many of the technology and safety issues applicable to the PBMR will also be applicable to the GT-MHR. Thus, insights gained from the PBMR review will facilitate the GT-MHR review. These activities consist of reviewing GA's approach to licensing and the identification of regulatory requirements, policy, and safety issues, including proposed approaches for issue resolution. It will be necessary to evaluate the applicability of current regulatory criteria to the GT-MHR. Each of these areas is discussed below.

- **Approach to Licensing**

GA has proposed an approach to licensing the GT-MHR in the U.S. The approach includes building a single module in the U.S. under the combined license provision of 10 CFR Part 52 and, based upon that experience, certifying the design.

- **Identification of Regulatory Requirements, Policy and Safety Issues**

Since the preapplication review is expected to build on the previous preapplication experience and review documented in NUREG-1338, "Draft Preapplication Safety Evaluation Report for the Modular High-Temperature Gas-Cooled Reactor," several technical and policy issues have already been identified and addressed. Initially, four areas will need further review and analysis. These areas of potential review include:

1. Accident Selection (e.g., range of initiating events/accidents including PRA insights and treatment of uncertainties)
2. Selection of Safety-related Structures, Systems, and Components (e.g., design requirements (redundancy and diversity) including safety classification)
3. Fuel Performance (e.g., criteria and basis for fuel design, manufacture, testing, and use)
4. Containment/Confinement (e.g., accident source term determination and need for emergency planning)

It is expected that certain technology, safety and regulatory assessments performed during the preapplication phase will lead to other areas for review. Closure of associated issues can be achieved on a case-by-case basis depending on available time and resources.

Conduct of Interactions and Documentation

Meetings with GA and DOE on specific or generic topics related to GT-MHR design, safety, technology, regulatory, and licensing process issues will be held. Technical information should be provided to the staff well in advance of the meeting dates. Following each meeting, GA and DOE, as appropriate, will need to document any additional information they present, including any information requests for NRC feedback. ACRS/ACNW and stakeholder insights will be sought. An approach for resolving policy issues would be provided to the Commission for guidance and will include stakeholder input. The staff will forward to GA, any Commission guidance that results from these interactions. Documentation to GA may include SECY papers to the Commission for information or for guidance on policy issues, and letters providing feedback on technical and process issues. A preapplication safety evaluation report on the GT-MHR design itself would not be written.

Communication and Coordination

Although RES will have the lead for preapplication activities, this effort will involve close coordination with and support from NRR and NMSS, and will include meetings with GA, reviews of GA submittals on selected topics, and interactions with ACRS and other stakeholders. The interactions (both domestically and internationally) that the staff has been having on HTGR technology also provide knowledge and experience applicable to the GT-MHR.

Resources and Schedule

It is estimated that approximately 21 months would be required to complete the preapplication plan, assuming timely submittals and responses to staff questions from GA. This schedule is subject to change and depends on the level of technical support and financial commitment by GA. The generic nature of many technical issues already being considered, and the similarities with preapplication activities documented in NUREG-1338 (in combination with a focused preapplication review), should help reduce required resources. However, cancellation of the PBMR review introduces additional uncertainty into the review process. Again, the resource estimate and schedule may change as additional information becomes available and are dependent on the technical and regulatory areas that will be covered during the preapplication period.