

December 06, 2001

MEMORANDUM TO: William D. Travers
Executive Director for Operations

FROM: Ashok C. Thadani, Director */RA by Roy P. Zimmerman for:*
Office of Nuclear Regulatory Research

SUBJECT: SUMMARY OF THE NRC DELEGATION VISIT TO CHINA AND
JAPAN ON SAFETY ASPECTS OF HIGH-TEMPERATURE GAS-
COOLED REACTOR DESIGN AND TECHNOLOGY

release

On September 3-5, 2001, and September 7, respectively, an NRC delegation met with Chinese nuclear safety regulators, scientists, engineers, and Japanese nuclear design and safety engineers. The purpose of these meetings was to open up channels of communication for exchange of technical information and to improve the Agency's knowledge and understanding of advanced high-temperature gas-cooled reactor (HTGR) design and technology. The visits were arranged in connection with the NRC staff action plan to expand staff expertise and understanding of world-wide experience in technology specifically applicable to the Pebble Bed Modular Reactor (PBMR) and the Gas Turbine-Modular Helium Reactor (GT-MHR). The delegation consisted of Charles Ader, Stuart Rubin, Donald Carlson, and Joe Muscara, Office of Nuclear Regulatory Research (RES), Yuri Orechwa, Office of Nuclear Reactor Regulation (NRR), and Janice Dunn Lee, Office of International Programs (OIP). In China, 2 days were spent in Beijing at the National Nuclear Safety Agency (NNSA) and 1 day was spent at Tsinghua University's Institute of Nuclear Energy Technology (INET), located in Changping County northwest of Beijing. In Japan, the delegation spent 1 day at the Japanese Atomic Energy Research Institute (JAERI) in Oarai.

In China, discussions were held on the design, safety review and initial operational experience of the 10-megawatt-thermal (MWt) High Temperature Gas-Cooled Reactor Test Module (HTR-10). Discussions in Japan were on the design, design-analysis, safety analysis, and initial operational experience of the 30-MWt High Temperature Engineering Test Reactor (HTTR). Non-proprietary reports and documents were exchanged, and insights were received on a broad range of technical topics. Additional follow-up documents were requested and possibilities for cooperative agreements to expand NRC's technical understanding of HTGR technology were discussed.

A list of the Chinese and Japanese participants in these meetings and their affiliations is provided in Attachment 1, and a copy of the agendas for the meetings at NNSA, INET, and JAERI is provided in Attachment 2. Attachment 3 provides a summary of the presentations, discussions, and observations during the 4 days of meetings. Attachment 4 lists the handouts and other documents that were provided in connection with the various presentations,

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discussions, and tours. Copies are available through the representatives from RES, NRR and IP who participated in the delegation. Attachment 5 is a table comparing the HTTR, HTR-10, and PBMR design parameters.

Attachments: 1. Lists of Chinese and Japanese Participants
2. Agendas for the Visits to NNSA, INET, and JAERI
3. Summary of the Visits to NNSA, INET, and JAERI
4. List of Handouts and Documents Provided
5. Comparison of HTTR, HTR-10 and PBMR Design Parameters

cc w/atts.:

C. Paperiello, DEDMRS
W. Kane, DEDR
J. Dunn-Lee, OIP
S. Collins, NRR
M. Virgilio, NMSS
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**Summary of the September 3-5, 2001, Visit to China
and the September 7, 2001, Visit to Japan
On Safety Aspects of High-Temperature Gas-Cooled Reactor
Design and Technology**

National Nuclear Safety Administration (NNSA)

Introduction

On September 3, 2001, the U.S. NRC delegation met with Dr. Zhao Yimin, Deputy Director General of NNSA, members of his staff, and staff from the Nuclear Safety Center (NSC) involved in the review of the 10 Megawatt-thermal (MWT) high-temperature reactor, HTR-10. Dr. Zhao extended a cordial welcome to the NRC delegation and introduced the staff of the NNSA and NSC who were responsible for licensing the HTR-10.

Janice Dunn Lee introduced the NRC delegation and gave a brief overview of the U.S. NRC's bilateral cooperation with China. She noted the recent high interest in the HTR-10, which has culminated in recent visits by NRC staff, including Commissioner Merrifield in March 2001, and in anticipated future visits from the NRC Office of Nuclear Reactor Regulation and from Chairman Richard Meserve. She explained the purpose for the current visit, which stems from the new economic environment for the nuclear industry in the U.S., and the challenges posed by the need for a new regulatory environment and the establishment of an infrastructure for new construction of nuclear power plants. In addition, she noted the many changes occurring in the U.S., including plant life extension, sales of existing nuclear power plants, utility consolidation, authorization for power up-rates, consideration of plans for completing plants whose construction was halted years ago, consideration of new plant construction with certified designs or new designs, and the Bush Administration's national energy policy calling for major energy expansion throughout the country. She explained the NRC safety mission, organization, and the responsibilities of the various offices within NRC in licensing new reactors.

Charles Ader gave a presentation on the purpose of the NRC mission to China, the background for the recent high-temperature gas-cooled reactor (HTGR) initiatives in the U.S., and the NRC's regulatory infrastructure development needs related to HTGR research and licensing. Stuart Rubin gave a presentation on the ongoing pre-application review activities related to the Pebble Bed Modular Reactor (PBMR). His presentation covered the goals and objectives for the review, the NRC's strategy and resources that would be utilized to conduct the review, and the technical areas that were expected to be addressed in the review. He also discussed the challenging technical, safety, and policy issues that were expected to be evaluated in order to establish staff and Commission policy guidance for successful resolution of the issues as part of a PBMR license application.

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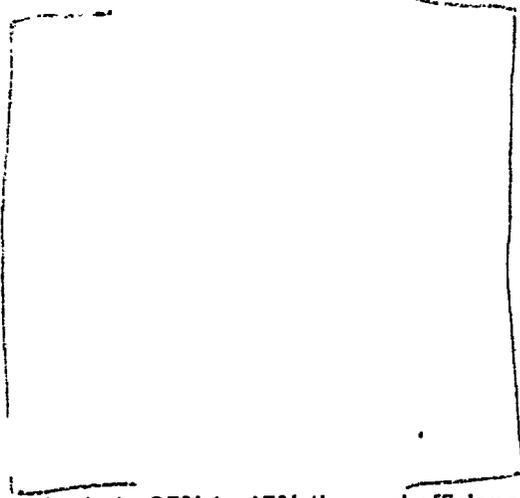
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EX.4

Table: Comparison of Key Design Parameters of HTTR and HTR-10 with PBMR

Parameter

Thermal power
 Outlet coolant temperature
 Inlet coolant temperature
 UO₂ Fuel Enrichment
 Fuel element type
 He Coolant Flow Direction
 Pressure vessel
 Number of cooling loops
 Heat removal
 Primary coolant pressure
 Containment type



Ex. 4

PBMR

343 to 266MW*
 ~900°C
 500°C
 8%
 Pebble
 Downward
 Steel
 1
 Direct Cycle
 7 MPa
 Confinement

* based on a projected 120MWe output at ~35% to 45% thermal efficiency