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Mizunami Underground Research Laboratory Project
Results from 1996-1999
(Revised edition)

Abstract

Tono Geoscience Center (TGC), Japan Nuclear Cycle Development Institute (JNC) has been carrying out a wide range of geoscientific research in order to build a firm scientific and technological basis for geological disposal. One of the major components of the ongoing geoscientific research program is the Mizunami Underground Research Laboratory (MIU) Project in the Tono area, central Japan. The R&D work for the MIU Project has the following main goals:

- To establish comprehensive techniques for investigating the geological environment
- To acquire data on the deep geological environment
- To develop a range of engineering techniques for deep underground application

The development of the MIU will occur in three overlapping Phases over a 20-year life cycle: Phase I (Surface-based Investigation Phase) began in 1996; Phase II (Construction Phase) and Phase III (Operation Phase) have yet to start.

The Shobasama Site has been studied in detail by surface-based geological, geophysical, hydrogeological, hydrochemical and rock mechanical investigations in the reporting period. Ground geophysical surveys, hydrological monitoring and multi-disciplinary borehole investigations have been carried out in the three 1,000 m deep boreholes drilled for the MIU Project in the reporting period. Based on the information obtained, geological, hydrogeological and hydrochemical models and rock mechanics conceptual models have been constructed. Groundwater flow simulations have been carried out in order to evaluate the validity of the hydrogeological modeling method. These investigations have facilitated the accumulation of technical knowledge and expertise on the methodologies and techniques needed to characterize the deep geological environment.

The results of these R&D activities have been used in the Second Progress Report on Research and Development for the Geological Disposal of HLW, commonly known as the H12 Report, submitted by JNC to the Japanese Government in 1999. The results have also been widely utilized by various research institutes, including universities. JNC will continue the research to provide a scientific and technological basis for safety regulations and repository siting.

This report is also available in Japanese: JNC Technical Report, JNC TN7400 2001-001

1 Introduction

The Atomic Energy Commission of Japan formulated the 'Long-term Program for Research, Development and Utilization of Nuclear Energy' [1] (henceforth 'Long-term Program') in June 1994 with a subsequent revision in November 2000. This program laid down basic policy, stipulating that 'scientific research on deep geological environment as the basis for research and development of geological disposal should be advanced'. The Japan Nuclear Cycle Development Institute (JNC) has been promoting and carrying out scientific research on deep geological environments under the name 'geoscientific research'. The Long-term Program presented the following policy perspectives for underground research facilities to emphasize their importance.

- Deep underground research facilities play an important role in research relating to geological disposal. They allow us to understand the characteristics of the geological environment and to improve the reliability of the models used for performance assessment of disposal systems. They also provide opportunities for comprehensive research that will contribute to overall understanding of Japan's deep geological environment.
- It is recommended that more than one facility should be constructed, considering the range of characteristics and features of Japan's geology and other relevant factors.
- It is important to plan underground research facilities on the basis of results obtained from research and development work already carried out, particularly the results of scientific studies of the deep geological environment. Such a plan for underground research facilities should be clearly separated from the development of an actual repository.

Based on the basic policy outlined above, JNC began the Mizunami Underground Research Laboratory (MIU) Project. This report is a summary of the geoscientific research activities and the results for the period from 1996 FY to 1999 FY ('Phase I-a', See Section 3.2) of the MIU Project. The research was performed according to the 'Master Plan of the Mizunami Underground Research Laboratory' (henceforth 'Master Plan') [2] and the annual plan of the geoscientific research [3~7] for the MIU Project.

The revision to the Long-term Program in November 2000, stipulated that:

- Based on the results of past research, JNC should steadily carry on research and development activities to evaluate the reliability of geological disposal technologies and to establish a safety assessment method, using research facilities for the deep geological environment. The research facilities for deep geological environments will serve not only as a place for scientific investigations, but also as a place for deepening public understanding of research and development activities related to the geological disposal of nuclear waste.