Minutes of the 26th Technical Committee Meeting on JAEA's URL Projects

Date and time: 12th June 2020, 15:00 to 18:00

Format: Videoconference using WEB meeting system

Participants:

Committee member:	M. Nishigaki (Chairman, Okayama Univ.)
	K. Kamemura (Fukada Geological Inst.), S. Kubota (NUMO)
	J. Shimada (Kumamoto Univ.), M. Shinji (Yamaguchi Univ.)
	M. Chigira (Fukada Geological Inst./Kyoto Univ.)
	T. Tokunaga (Univ. of Tokyo), R. Hataya (CRIEPI)
	A. Marui (AIST), K. Masumoto (Shimane Univ.)
Domestic experts:	T. Saegusa (NUMO), M. Emori, M. Kawakubo (RWMC)
	T. Hasegawa, S. Nishimoto (CRIEPI), I. Machida (AIST)
International experts:	S. Vomvoris (Nagra, Switzerland), J. Andersson (SKB, Sweden)
	S. Mayer (IAEA), I. McKinley (McKinley Consulting, Switzerland)
	E. Webb (Sandia National Laboratory, USA)*

*The separate meeting was held on the 17th June 2020.

JAEA	
Geol. Disp. R&D Dept.:	T. Seo, M. Shibata, K. Hama , K. Tanai etc.
Horonobe:	T. Sato, T. Iwatsuki, Y. Sugita , N. Taniguchi etc.
Tono:	E. Sasao, S. Mikake etc.

Handout:

Document 26-1: Introductory Remarks

Document 26-2: Overview of R&D Activities at the Horonobe Underground Research Laboratory from FY2020 – Research Plans for the Next 9 Years –

【Summary of Meeting】

The secretariat overviewed the objectives of this videoconference and the chairman noted the participation of external experts in addition to the domestic technical committee members in order to gain broader advices and opinions: hence11 experts from Japan and overseas participated. After that, JAEA presented the outline of the research and development of the Horonobe Underground Research Plan from FY2020, with discussions from a technical point of view and advices on implementing the plan. The main comments are as follows.

(1) Overview of plans

○ The research plan from the FY2020 is important for establishing the technical base of geological disposal, and it should be contributed in the implementer's technology development program in a timely manner. Therefore, the plan should clarify the goals and the processes, and then establish a close link and collaboration with the implementer and other related research organizations.

(2) Applicability to Japanese Geological Environments

○ In the Horonobe URL, the Wakkanai formation is divided into two domains (shallow domain and deep domain) with different geological characteristics. By effectively using each domain, suitable geological disposal technologies could be developed, which can be applicable to various geological environments in Japan.

○ The shallow domain has a more heterogeneous geological formation, but has the advantage that the continuity of the geological condition from the underground to the surface can be easily understood and accessed. Therefore, in this domain, research on the interface between the geological environment and the biosphere (GBI) and operational technologies that do not depend on the geological environment could be effectively developed.

○ The deep domain has a more homogenous geological formation, with very slow groundwater flow, hence so geological characteristics suitable for studying evaluation of engineered barriers and natural barriers can be expected. This domain is advantageous in providing suitable conditions that, can contribute to the establishment of safe tunnel excavation and long-term maintenance technology at a great depth (high overburden pressure) environment, which are major common issues in Japan and overseas. Therefore, in this domain, full-scale tests focusing on the study for the evaluation of barrier functions and optimization of engineering technologies and tests for evaluating the long-term stability of underground facilities (such as design for deformation due to rock creep, self-sealing potential, development of deep excavation technology, etc.) would be valuable.

○ Furthermore, by comparing and integrating research data obtained from both shallow and deep domains, it would be possible to accumulate a wide range of knowledge and know-how, to improve the effectiveness and reliability of the geological disposal system in Japan.

○ As many quite different types and characteristics of sedimentary rock are distributed in Japan (and overseas), care must be taken to assess the applicability of the research methods and data obtained in Horonobe URL to other sedimentary rocks. Therefore, in future, JAEA should address development of common approaches, processes and best practices in R&D of

sedimentary rocks, as well as development of generic technology, with systematic comparison to other regional sedimentary rocks to gain a perspective of lessons learned.

○ It is important to more realize/clarify the content of each experiment plan to contribute to further improving the reliability of implementer's safety case. An example of this is the safety case for the Opalinus clay in Switzerland leading to a focus on gas migration (in the excavation disturbed zone along the axial direction of the tunnel or through specifically designed gas-permeable seals), with emphasis on its impact on the functioning of the disposal system.

○ The meaning of “optimization” of disposal concept and engineering technology, which is one of the research objectives, is not always clear but there is certainly great international interest in this topic. It seems that there are multiple optimization aspects, such as cost, implementation time and environmental impact, but experimental concepts should be made more concrete based on discussions with external experts, assessment of domestic and foreign needs and evaluation of international trends.

○ It is understandable that future research plans focus on themes related to engineering technology and safety evaluation. However, it should be recognized and shared that the understanding of the in-situ geological characteristics, especially the understanding of long-term evolution in groundwater flow system including water chemistry caused by tunnel excavation and validation of the geological environmental models etc. are important to provide fundamental background for these themes.

(3) Perspectives of International R&D

○ The Horonobe URL is one of the few generic underground research facilities in the world that can directly access deep underground sedimentary rocks, and has the capability and potential to further develop to an advanced joint research and training base, not only domestically but also internationally. In particular, it may greatly contribute to the development of geological disposal plans in geographically close Asian and Pacific Rim countries. It is thus strongly recommended to strengthen international collaboration and cooperation from the perspective of Japan's international contribution in the radioactive waste management field.

○ The Horonobe URL has a wide range of geological characteristics and geographical conditions relevant to the disposal plans in other countries (geological structure, groundwater system, rock properties, proximity to the coast, characteristics of candidate host rocks), and many research themes of international interest are planned in the Research Plan from 2020.

In particular, demonstration of the option of disposal concepts such as optimization of disposal concepts and engineering technology development including robotics (ex. wireless data transmission technology, remote operation technology etc.), confirmation of applicability of engineered barriers in actual geological environments such as understanding and modeling of near field mass transport including excavation disturbed zone would be promising as advanced common issues.

○ In order to further promote international research cooperation utilizing the Horonobe URL, JAEA should initiate further discussions with relevant parties, both domestic and international.

(4) <u>Other</u>

○ In order to promote international research collaboration, JAEA should prepare materials related to research plans and achievements in English to the extent possible, and make them widely available on the website. In addition, it would be advantageous to use the same WEB conference system as this time to hold continuous and multifaceted discussions with experts, including those from overseas.

○ The achievements and trends of international joint projects, including in Europe, are important information for clarifying the significance and role of R&D, and the experiences and lessons learned through those successes and failures should also be actively utilized.

○ From a broader perspective, new technologies are being developing in related engineering fields such as oil & natural gas development, underground storage of CO_2, and in earth science fields. It is considered that linking up with such pioneering research activities will enhance the value of JAEA as a research institution.