MEMORANDUM OF UNDERSTANDING
BETWEEN
THE DEPARTMENT OF ENERGY OF THE UNITED STATES OF AMERICA
AND
BUNDESMINISTERIUM FÜR WIRTSCHAFT UND TECHNOLOGIE
FOR
COOPERATION IN THE FIELD OF
GEOLOGIC DISPOSAL OF RADIOACTIVE WASTES

This Memorandum of Understanding (Memorandum) is between the Department of Energy of the United States of America (DOE) and the Bundesministerium für Wirtschaft und Technologie (BMWi), hereinafter collectively the "Participants".

I. PREAMBLE

1. Several forms of radioactive waste require disposal in deep geological repositories to protect humans and the environment. For this reason, it is necessary to bring appropriate scientific research and development to bear on the evaluation of the potential operational and long-term safety of geological systems designed to isolate radioactive materials from the biosphere.

2. The Participants have a mutual interest in supporting these goals and recognize that international scientific cooperation is of mutual benefit in assuring progress in science through shared research and development.

3. The Participants are responsible for the following projects and programs:

   DOE's Office of Nuclear Energy (DOE/NE) has responsibilities relating to the disposal of spent nuclear fuel and high-level radioactive wastes, including site selection, site characterization, repository design, licensing, constructing, operation and final closure. DOE/NE is supported by multiple National Laboratories on this effort. Under this Memorandum, staff from these National Laboratories may participate in discussions of repository-related technical work conducted by their organizations.

   DOE's Office of Environmental Management (DOE/EM) Carlsbad Field Office (CBFO) is responsible for managing operations, transportation, disposal, and all research and development associated with permanent disposal of defense-related transuranic nuclear waste in the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. The CBFO is supported by Los Alamos National Laboratory and Sandia National Laboratories. These two National Laboratories support CBFO in terms of repository-related scientific research. CBFO contracts the management and operations of WIPP, and any cooperative work regarding operations would involve the management and operating contractor (currently, Washington TRU Solutions LLC).

BMWi is the German government ministry responsible for non-site specific R&D in the area of high-level radioactive waste and spent fuel disposal.

BMWi is supported by its operating contractor Project Management Agency Karlsruhe (PTKA-WTE) within the Karlsruhe Institute of Technology that would represent BMWi in terms of any cooperative work regarding the technical insights gained from repository operations.

With respect to its support of R&D, BMWi utilizes the following national organizations: Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, DBE TECHNOLOGY GmbH, TU Clausthal, Institut für Gebirgsmechanik GmbH, and institutes of the National Laboratories of the Helmholtz Association: KIT/INE, FZJ/IEF, HZDR/IRC.

II. OBJECTIVE AND FORMS OF COOPERATION

1. The objective of this Memorandum is to provide a general framework for collaboration between DOE, through DOE/NE and DOE/EM/CBFO, and BMWi, through PTKA, in the area of understanding the long-term performance of geologic disposal systems for radioactive wastes in various geologic formations, including planning, characterizing, building, operating, and closing radioactive waste repositories in deep geological formations. The focus of cooperation activities is disposal of waste in salt formations.

2. Cooperation under this Memorandum may include, but is not limited to:

   - Exchange of general technical and scientific information, organization of meetings, seminars and workshops;
   - Coordination of participation in research and development programs of the European Commission (conducted under specific task agreements that may be separately concluded with the European Commission);

   - Observation of and sharing finalized results from studies carried out in the U.S. or Germany, as appropriate;

   - Exchange of staff, pursuant to appropriate written arrangements between the sending and receiving organizations; and

   - Exchange of academic personnel (university) for education/training pursuant to appropriate written arrangements.

III. POTENTIAL TECHNICAL SUBJECTS AND ACTIVITIES

Examples of potential technical subjects and activities that may be addressed through the cooperation forms described above are listed in the Appendix, which constitutes an integral part of this Memorandum.

IV. COSTS

The costs resulting from cooperation under this Memorandum are the responsibility of the Participant that incurs them. Cooperation under this Memorandum is subject to the availability of appropriated funds, personnel, and other resources.

V. GENERAL CONSIDERATIONS

1. Cooperation under this Memorandum may begin upon signature.
2. This Memorandum may be revised at any time by the Participants' mutual consent in writing.
3. The Participants may discontinue this Memorandum by mutual consent in writing at any time. Alternatively, a Participant that wishes to discontinue its participation in this Memorandum should endeavour to provide at least 90 days advance notice in writing to the other Participant.
4. This Memorandum does not create any legally binding obligations between the Participants.

Signed in duplicate.

FOR THE DEPARTMENT OF ENERGY OF THE UNITED STATES OF AMERICA:

Monica Regalbuto
Deputy Assistant Secretary for Fuel Cycle Technologies

Date: 19/09/11
Place: Washington DC

FOR BUNDESMINISTERIUM FÜR WIRTSCHAFT UND TECHNOLOGIE:

Dr. Dorothee Mühl
Deputy Director General

Date: 14/09/11
Place: Carlsbad

Edward J. Ziemianski,
Interim Manager, Carlsbad Field Office

Date: 9/14/2011
Place: Carlsbad

APPENDIX

POTENTIAL TECHNICAL ACTIVITIES APPLICABLE TO EXCHANGES BETWEEN BMWi and DOE/NE or BETWEEN BMWi and DOE/EM/CBFO

1. Information exchange on storage facilities:
   - Research and development program approaches and results
   - Concepts and technologies
   - Transfers and handling
   - Safety
   - Radiological monitoring

2. Selection and characterization methodologies for disposal sites:
   - Reconnaissance methods for exploration purposes from the surface, including geophysical methods
   - Non-destructive underground exploration and characterization methods

3. Information exchange on disposal concepts:
   - Disposal concepts, architectures and technologies
   - Waste types
   - Waste-package transfer and handling
   - Engineered barrier systems: selection of materials and implementation technologies

4. Safety assessment of disposal facilities during the operating and post-closure phases:
   - Exchange of R&D program approaches and results in support of:
     - Safety-analysis methodologies, definition of scenarios
     - Scientific contributions for the safety case
     - Modelling thermal-hydrological-mechanical interactions and radiochemstry
     - Digital modelling and simulation, code-validation strategies, benchmark exercises

5. Observation of experimental programs carried out in underground laboratories or facilities:
   - Design of experiments
   - Conduct of experiment
   - Follow-up of measurements and interpretation of data

6. Participation in demonstration programs
   - Package transfer and handling
   - Monitoring
   - Engineered barrier system (backfill, sealing of shafts, drifts and boreholes)

7. Characterization of the behavior of waste under repository conditions

8. Implementation management of the repository:
   - Gradual implementation and reversible management of the repository
   - Environmental, package and disposal-facility monitoring
   - Public-information and consultation methodologies
   - Long-term memory preservation and management of relevant information