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NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

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**2010 SURVEY ON LONG-TERM PRESERVATION OF INFORMATION AND MEMORY FOR
GEOLOGICAL DISPOSAL OF RADIOACTIVE WASTE**

Long-term preservation of records, knowledge and memory is an important component of the RWMC programme of work. As part of its series of initiatives in this area, the RWMC surveyed national programmes for activities, information and needs related to long-term preservation of information and memory. The present document reports the answers provided by organisations in 12 countries (Belgium, Canada, Finland, France, Hungary, Japan, Korea, Spain, Sweden, Switzerland, United Kingdom and the USA,) to the five RWMC questions. The original answers were updated during the all of 2010. The focus is on geological disposal of radioactive waste.

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BACKGROUND

Preservation of information and memory across generations is a cross-cutting theme of increasing importance for radioactive waste management. Because of the experience accumulated by the advanced national programmes that the RWMC represents, and the breadth of its related high-level initiatives, the Committee is uniquely placed internationally to combine resources and help develop state-of-the-art guidance on the *long-term preservation of information and memory*. In the context of fostering knowledge consolidation and transfer (KCT), the RWMC has already identified – in its reference document¹ on KCT – the area of *inter-generational* transfer of knowledge as one of two areas needing development.

In 2009, the RWMC decided to implement its programme of work in the area of information preservation and long-term memory as a series of projects or lines of actions opened by the RWMC and supervised by its Bureau. In order to better define its first series of projects the RWMC performed a survey of its organisations needs and available materials and experience. At its meeting in 2010 the RWMC determined that the survey materials provided by organisations from 12 NEA countries constitute a good contribution to the literature in this field, and certainly to the upcoming projects. They provide as well a good baseline of information against which to measure progress a few years hence.

ABOUT THIS DOCUMENT

This document reports the answers provided by organisations from 12 countries (Belgium, Canada, Finland, France, Hungary, Japan, Korea, Spain, Sweden, Switzerland, United Kingdom, and the USA,) to five questions related to long-term preservation of information and memory in the field of geological disposal. The questions are as follows:

- What specific priority areas for long-term memory development have been identified in your agencies/countries? Which are the time scales of largest interest?
- Do these priority proceed from good practice or/and from specific laws, regulations, policies exist in your country that set out requirements for long-term memory in long-term waste management?
- How far advanced are you regarding establishing an action plan for long-term information and memory preservation in the field of geological disposal? Are you addressing the following RWMC questions:
 - What information should be preserved?
 - Why?
 - Where?
 - How should it be preserved?
 - Which target groups?
 - Which time horizons?
- What suggestions do you have for possible areas of focus for RWMC? (e.g. an international project that may assist Members?) What are the untapped areas that deserve more attention?
- Would you have studies, research, reports, policies that you might share with RWMC members?

¹ [NEA/RWM(2009)7]: Preserving Information and Memory Across Generations: Proposal for a Dedicated Initiative and a Specific Project. Available at www.nea.fr/rwm/docs/2009/rwm2009-7.pdf

Question 1:

What specific priority areas for long-term memory development have been identified in your agencies/countries? Which are the time scales of largest interest?

Spain	Switzerland	United Kingdom
<p>In Spain the Management of spent fuel and high level waste, (HLW) is contemplate in the Sixth General Radioactive Waste Plan, that was approved by the government in 1996. In this plan is indicated that: “the preferred basic option is limited temporary storage followed by a definitive disposal facility that, as regards economic calculation and planning, would enter into operation beyond the year 2050”.</p> <p>Therefore, in the current moment the development of long-term memory development is not a priority in the Spanish HLW programme.</p> <p>Nevertheless, as precedent, in the LILW disposal facility at El Cabril (essential part of the Spanish national system), a system for the preservation of information is developed and implemented, according to the requirements set up by the regulatory body (CSN) in the operating permit of this disposal facility. There is a selection of records that is necessary preserved for the institutional surveillance period and the preservation of records is carried out in a double place as better archive system.</p>	<p>1a) Monitoring period <i>From: Nuclear Energy Ordinance: Art. 68</i> The owner of a deep geological repository must describe in an up-dated project the planned measures for monitoring the repository after emplacement of the waste has been completed. He must also propose a duration for the monitoring period. The Department orders the start of the monitoring period and specifies its duration. It may also extend this period as required. <i>Time scale of interest: Up to a hundred years (?)</i></p> <p>1b) Long-term Documentation <i>From: ENSI guideline G03, chapter 6.3</i> The emplacement of all waste packages in the repository has to be documented. In addition to the documentation on construction in accordance with Article 27 of the Nuclear Energy Ordinance and on operation in accordance with Article 41 of the Nuclear Energy Ordinance, documentation has to be prepared on long-term securing of knowledge on the geological repository according to Article 71 of the Nuclear Energy Ordinance. At least three copies of this documentation have to be provided following final closure of the repository and archived in different locations. The long-term durability of the documentation has to be demonstrated and the required maintenance measures explained. In addition to the requirements of Article 71 of the Nuclear Energy Ordinance, the documentation has to contain at least the following information:</p> <ol style="list-style-type: none"> 1. A description of the closed facility and its location. This includes the location and extent of the underground installations and the geometry and properties of the surrounding rock layers; 2. Information on each emplaced waste package, with its exact position and the documentation produced for its conditioning and emplacement; 3. Information on interim storage and any subsequent conditioning of waste packages in so far as this relates to properties of the waste packages that deviate from 	<p>We have identified the need for long-term information and knowledge management in two broad areas. The first area is the more conventional technical area concerning, for example i) identification of individual radioactive waste packages, the nature and quantities of waste that they contain, their precise location when emplaced in a geological disposal facility, or ii) the location, layout, features, contents and monitoring arrangements of a geological disposal facility. The second area concerns more contextual information and knowledge, sometimes referred to as metadata, which we believe will be essential if future generations are to understand the technical information that is handed on. Examples in this area include the governance of waste management that led to the production of waste packages and the construction, regulation and monitoring of the disposal facility, and the basis for decision-making that led to the final disposal system.</p> <p>We have principally two timescales in mind. We want the information and knowledge to be available throughout the lifecycle of the disposal facility extending beyond the time when institutional control over the site might be relinquished, in our case a period of at least 130 years. However, our studies show that in order to achieve that long-term objective we must focus on the timescale for transferring the information and knowledge to the next generation in a way that does not foreclose their options for managing it in turn, which we characterise as a timescale of order 30 years.</p>

	<p>the documented standard design and the information is relevant for possible retrieval of the waste or long-term safety;</p> <ol style="list-style-type: none"> 4. A summary of the results from the monitoring phase; 5. Results of the updated safety assessment. <p><i>Time scale of interest: Several hundred years</i></p> <p>1c) Protection zone <i>From: Nuclear Energy Ordinance: Art. 70</i> The protection zone of a deep geological repository must be defined on the basis of the report on long-term safety submitted with the licence application. The protection zone must encompass:</p> <ul style="list-style-type: none"> • all parts of the repository, including accesses; • the rock volumes that provide the hydraulic containment of the repository; • the rock volumes that significantly contribute to the retention of radionuclides that could be released from the repository over the course of time. <p>After issuing the general licence, the Federal Office shall request the relevant land registry to add the following note to the entries for the plots of land situated within the perimeter of the protection zone: "Provisional protection zone of a deep geological repository". After issuing the operating licence, the Federal Office shall request the relevant land registry to add the note, "Definitive protection zone for a deep geological repository".</p> <p><i>Time scale of interest: Several hundreds of years</i></p> <p>1d) Marking the geological repository <i>From: Nuclear Energy Act: Art. 40</i> The Federal Council stipulates that the repository be permanently marked.</p> <p><i>Time scale of interest: As long as reasonably feasible</i></p>	
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<p>As indicated in the previous point, there is no priority in the case of the HLW programme. However, in the case of the “El Cabril LILW disposal facility, the priority on the preservation of information was set up formally in the Ministerial Order authorizing the operation of the facility</p> <p>On the other hand, the current record retention system applicable to nuclear facilities is described at the level of guidance in the CSN’s safety guide GSG 10.02 “System of documentation subject to quality assurance programmes at nuclear facilities” which contains general recommendations on the methodology and criteria for the implementation of a documentation system in the different phases of nuclear facilities development (site studies and design project, construction commissioning, operation, definitive shutdown and closure)..</p>	<p>As noted above, the priorities proceed from law and regulatory guidelines.</p>	<p>These priorities stem from both good practice particularly that adopted in equivalent programmes in other countries, and from regulations and policies. For example there is policy direction to assess risks that may be realised by knowledge loss, and there are regulatory licence conditions that require long-term information management.</p> <p>We are currently developing a strategy for long-term information and knowledge management which will be issued for consultation with stakeholder groups. Following assimilation of stakeholder views we intend to develop a workable approach based on the agreed strategy. Alongside the proposed strategy we are developing a standard that will address the practical questions in the RWMC list.</p> <p><i>o What suggestions do you have for possible areas of focus for RWMC? (e.g. an international project that may assist Members?) What are the untapped areas that deserve more attention?</i></p> <p>We suggest that the focus for the RWMC should be on the long-term management of enabling or contextual information and the importance of metadata. This is because we believe that to be effective the information and knowledge has to be managed in a way that allows succeeding generations to use it and manage it in the way they deem most appropriate. We strongly recommend that there is no need for further study in the field of practical means of preserving information, where the existing information is more than adequate to support decisions by national programmes.</p> <p><i>o Would you have studies, research, reports, policies that you might share with RWMC members?</i></p> <p>A high proportion of the work that we have conducted is published and we would be pleased to share this and the results of our current studies in support of strategy and standard development, mentioned above, with RWMC members.</p> <p>The UK regulators have published guidance on managing information and records relating to radioactive waste. The guidance provides an overview of the relevant policy drivers, regulatory requirements and expectations relating to managing information and records about higher activity radioactive wastes on licensed nuclear sites. It covers existing national and international standards and practices for managing information. It also discusses some of the specific issues</p>
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		<p>associated with managing information about radioactive waste over the long term (available at: http://www.hse.gov.uk/nuclear/wastemanage/rwm-part3d.pdf). (February 2010)</p>
<p>There is not a forecast of the beginning of a plan for long-term information and memory preservation in the field of geological disposal.</p> <p><i>What information should be preserved?</i> Basically, final documentation on waste characteristic and activity inventory, the waste packages location and the installation (relevant construction and operation data).</p> <p><i>Why?</i> Because possibly only the final data is important for the next generations</p> <p>□</p> <p><i>Where?</i> We haven't opinion about; but given the long-term scales of time it should be preserved in different places at national and international levels. It could be is an issue for the RWMC development</p> <p><i>How should it be preserved?</i> It is in function of support of information that will be used. It could be is an issue for the RWMC development</p> <p><i>Which target groups?</i> We haven't opinion about. See response to previous question</p> <p><i>Which time horizons?</i> It is based on the durability of the data medium is used</p>	<ul style="list-style-type: none"> • What information should be preserved: See 1b and 1c. • Why: - • Where: Stipulated at three different locations (example federal archives, archives of the canton, archives of the community) to enhance chances of long-term transfer of knowledge. • How should it be preserved? The long-term durability of the documentation has to be demonstrated and the required maintenance measures explained. • Which target groups? Governmental (federal/state/municipality) level. • Which time horizons? As stated above 	

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<p>We agree with the idea of an international project that may assist Members</p>	<p>To be discussed</p>	<p>We suggest that the focus for the RWMC should be on the long-term management of enabling or contextual information and the importance of metadata. This is because we believe that to be effective the information and knowledge has to be managed in a way that allows succeeding generations to use it and manage it in the way they deem most appropriate. We strongly recommend that there is no need for further study in the field of practical means of preserving information, where the existing information is more than adequate to support decisions by national programmes.</p>
<p>We haven't now studies in relation to the HLW disposal, but are open to share with RWMC members, the experience and studies that we have in relation with the documentation preservation system in the LILRW field.</p>	<p>Nuclear Energy Act and Ordinance, ENSI guideline G03 (in English)</p>	<p>A high proportion of the work that we have conducted is published and we would be pleased to share this and the results of our current studies in support of strategy and standard development, mentioned above, with RWMC members.</p> <p>The UK regulators have published guidance on managing information and records relating to radioactive waste. The guidance provides an overview of the relevant policy drivers, regulatory requirements and expectations relating to managing information and records about higher activity radioactive wastes on licensed nuclear sites. It covers existing national and international standards and practices for managing information. It also discusses some of the specific issues associated with managing information about radioactive waste over the long term (available at: http://www.hse.gov.uk/nuclear/wastemanage/rwm-part3d.pdf).</p>
<p>Finland</p>	<p>Hungary</p>	<p>Korea</p>
<p>The current priority is to collect and archive all information that may be relevant for long-term memory preservation of disposed waste. A longer-term objective is creation of an archiving system that contains the information to be passed to future generations and that minimizes the risk of loss of memory.</p>	<p>The priority areas for long term information or/and memory development in Hungary are :</p> <ul style="list-style-type: none"> • quality control, quality assurance aspects of long term memory development, • how can we ensure the long term usability of information, • effective knowledge transfer and sharing, • outsourcing and contract support, • regenerating lost knowledge. 	<p>Regarding the record management during the operating period, various data or information management system comprising data, document, resources management, and environment/site monitoring system such as RDCMS and SIMONS have been developed.</p> <ul style="list-style-type: none"> * RDCMS : Radwaste Disposal facility Construction Management System * SIMONS : Site Information and Monitoring System

USA	Japan	Canada
<p>The responses below incorporate information from the Department of Energy (DOE), Nuclear Regulatory Commission (NRC), and Environmental Protection Agency (EPA).</p> <p>In general, explicit requirements for records, markers, and other long-term memory preservation measures have been associated with the need to limit potential human intrusion at the disposal site. However, requirements have also been established to maintain the capability to retrieve waste for some period of time after disposal, which implicitly demands that detailed records of waste emplacement be developed and retained.</p> <p>Long-term memory preservation measures are to be developed prior to and as a condition of permanent closure (license termination) of the disposal facility. Actions to be taken to preserve knowledge of the repository including the nature of the hazard are: land use controls, permanent markers, and preservation of records (local, State and Federal government agencies and archives elsewhere in the world). Preserved records would be expected to include location of the repository, including the extent and design of the underground facility, boreholes, shafts and ramps, and the boundaries of the site; site data and the results of disposal system tests and analyses related to containment of the waste; and the nature and hazard of the waste.</p> <p>The timescales of interest may vary depending on the nature of the waste. EPA's generally applicable environmental standards for spent fuel, high-level waste, and transuranic waste (40 CFR part 191), which are used to regulate the Waste Isolation Pilot Plant (WIPP), contain a compliance period of 10,000 years and a requirement to implement passive institutional controls "to indicate the dangers of the wastes and their location"</p>	<p>In Japan, as a part of the fundamental R&Ds being pursued under the Governmental budget for the promotion of geological disposal etc, a study about the long-term record preservation has been done (RWMC : Radioactive Waste Management Funding and Research Center) 2003, 2008, 2009).</p> <p>There is not any qualitative requirement which has been officially defined in Japan and the following answers are the results of the study done in Japan.</p> <p>In the study, a new media for record preservation and an international/domestic institutional framework for record preservation have been proposed and tested. We have the research result that the most important time scale will be considered as a thousand of years after closure of a repository.</p>	<p>The Government of Canada's Policy on Information Management states that every employee is responsible for the management of the business information they create and receive on behalf of their department. Senior management, within the Department of Natural Resources (NRCan), is responsible for identifying priority areas for long-term retention of information which include all types of media such as electronic, paper, emails, videos, publications, etc.). They are also responsible to determine the retention period, as indicated in a document referred to as the retention schedule, for NRCan's information. The purpose of the retention schedule is to determine how long a time period is needed to keep information with the Department. In this case, the custody of these documents remains with NRCan.</p> <p>In 1999, NRCan signed an agreement with the National Archives of Canada for the transfer of archival records that are deemed to be of historical importance for Canada. The agreement has a long list of priority areas for the long-term preservation of information. At NRCan, some of these areas are as follows: Uranium Supply and Demand, Radioactive Waste Management, High Level Irradiated Fuel Waste Management, Low Level Radioactive Waste Management, Low Level Radioactive Waste Disposal Sites, Uranium Mine Tailings Management.</p> <p>The Nuclear Waste Management Organization (NWMO) has not identified any specific activities on long-term memory development pertaining to the Adaptive Phased Management approach of the Deep Geologic Repository.</p> <p>In the case of the Ontario Power Generation's Low and Intermediate Level Radioactive Waste Deep Geologic Repository, however, the NWMO has identified all project documents (i.e., records) that need to be retained permanently. Essentially these are the records that contain information supporting the Safety Case for the repository. Given that these records support the licence (i.e., construction, and later, operation), they have to be secure and retrievable. A records management system will address these issues. As the NWMO's Records Management system evolves over time (e.g., over the</p>

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<p>(191.14(c)). While there is no requirement that such passive controls be proven to endure and be understood for as long as 10,000 years, these controls are expected to be “the most permanent...practicable.” EPA’s compliance criteria for the WIPP (40 CFR part 194) allow DOE to take credit for passive institutional controls in reducing the likelihood of human intrusion for “several hundred years” at most, provided that DOE demonstrate that the controls are “likely to endure and be understood by potential intruders” over the proposed time period. NRC’s general requirements for geologic disposal of high-level waste (10 CFR part 60) incorporate EPA’s standards and compliance period, and also include provisions related to preservation of long-term memory (60.51(a)(2)). NRC established similar requirements in its licensing criteria for the proposed Yucca Mountain repository (10 CFR 63.51(a)(3)), which included a compliance period of up to 1 million years. It is unclear whether measures to preserve long-term memory can be required to endure for longer than 10,000 years, much less 1 million years.</p>		<p>operational period of the repository) security and retrievability will be maintained using the technology of the day. It will be the responsibility of the operating organization. It is only after the operational period ends and the facility are decommissioned that long-term (100s of years) information preservation is pertinent. The key information required to be retained for 100s of years would be identified at the decommissioning licence stage, as well as the retention medium, and location of storage. The medium would likely be long-life paper and the location – provincial or national archives.</p> <p>The Canadian Nuclear Safety Commission (CNSC), other than what is currently in the Regulations with respect to decommissioning and abandonment, has not given this issue much consideration. It is an area where further work needs to be done. As long as the repository is under licence, records must be maintained. One must, however, consider the possibility that future generations may wish to retrieve the waste at a later date. Which are the time scales of largest interest?</p> <p>The time scales for retaining information within NRCan are not fixed. As long as the information is needed, NRCan retains custody of it. Once the information is not necessarily needed by NRCan, the Department’s Records Office maintains the information on file for a period of 15 years. After that time elapses, NRCan may decide to extend the time period or transfer the records to the care and control of the National Archivist.</p> <p>The NWMO has indicated that the post closure safety assessments for the Adaptive Phased Management/Deep Geologic Repository assume that institution controls are effective for about 300 years.</p>
Belgium	France	Sweden
<p>No specific priorities identified yet for the geological disposal program. According to a recent “Citizens’ panel” (with an informal role) regarding the long-term management of HLW-Long-lived waste (including spent fuels), priorities should be given to:</p>	<p>Two areas are concerned by long-term memory at Andra.</p> <ul style="list-style-type: none"> • Manche disposal facility (CSM) which is in an institutional monitoring phase since 2003. The long-term memory was implemented between 1995 and 1998, and complemented every 5 years. 	<p>SKB has identified the need for long-term preservation of information and knowledge regarding a repository for spent nuclear fuel. Until now, SKB has approached the topic of long-term preservation of information and knowledge in a wide sense. SKB has conducted a number of studies on the topic (see references in the answer to question 5).</p>

<ul style="list-style-type: none"> ▪ The creation of a documentation centre, under the surveillance of an independent entity; ▪ Our responsibility towards future generations is to transfer from generation to generation the technical information and knowledge with regards to the disposal site and to create a type of memory. <p>The same panel requested a “reversibility period” of 100 years after the end of the disposal operation, period upon which the memory must certainly be kept.</p> <p>From the LLW program, the institutional control period extends to about 300 year after the end of disposal activities, i.e. about 350 years from now.</p>	<ul style="list-style-type: none"> • Aube disposal facility for which the monitoring phase should start in the middle of this century. The long-term memory is built day after day. <p>The duration of the long-term memory for these facilities is:</p> <ul style="list-style-type: none"> • 300 years after the beginning of the monitoring phase (prescription), • more than 500 years (indeed, implemented solutions can last between 600 and 1,000 years). <p>The French approach for long-term memory for surface disposal facilities takes into account five solutions :</p> <ul style="list-style-type: none"> • Three solutions for “passive memories”. In the first place, a “synthesis memory” in a relatively short book for global knowledge of the site for the public and decision-makers (a first version of “synthesis memory” in 169 pages has been produced, updated every ten years after each safety report). In the second place, a “detailed memory” to answer several future scenarios for an operator or a manager of the site to understand precisely what can be seen on the site and the near environment and to modify the site locally or globally (for example, for the “Manche disposal facility”, a “detailed memory” has been produced to answer several future safety scenarios; this detailed memory is around 500,000 pages of information, completed with new data every 5 years). In the third place, easements recorded in the local cadastre to forbid constructions, other uses, ground water for domestic use... • Two solutions for “active memories”. In the first place, some direct discussions with the public as site visits, conferences, open-days, special publications... In the second place, some other discussions with the local information commission (CLI) as meetings, debates with associations and representatives, contradictory examination of results... <p>Selected information for “detailed memory” are determined by several scenarios with combine environment, physical, social and historical, in line with the safety analysis. A review of the scenarios and the selection has been made by an internal</p>	<p>Some of the questions that were formulated and partly addressed while working with the topic are: How can we transfer information on the location of the repository? How can we transfer information on the properties of the waste and on how to handle it?</p> <p>Concerning time scales of interest, SKB recognizes the following phases:</p> <ul style="list-style-type: none"> • Phase 1: Before closure and decommissioning of the sites (including operation of the sites). • Phase 2: Post closure/decommissioning and through time when it can still be envisaged to have some form of control over the information that is transmitted (100 to 500 years?) • Phase 3: long term perspective when uncertainties make it improbable to have any form of control (>500 years). <p>SKB is considering different phases rather than strict time scales in order to better focus on activities linked to the transfer of information and on potential incidents or events that may hinder that transfer.</p> <p>As a result, SKB has identified different scenarios for the information transfer:</p> <p>Scenario A) The chain of transfer is unbroken and the information and knowledge can be interpreted and applied.</p> <p>Scenario B) The chain of transfer is unbroken but the information cannot be understood or interpreted (epistemic loss).</p> <p>Scenario C) The chain of transfer is broken due to an incident or accident and information disappears physically (physical loss).</p>
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	<p>committee. In the next 2 years, a French review and later an international review will be done. Then, every ten years, an international review will be organized to confirm the adequacy between the long-term memory and the needs of future generations.</p> <p>For the current decades, knowledge, facility configuration and documentation are managed digitally (for CSM, all the past is being digitized and will be entered in the databases by the end of 2010). If this phase isn't performed correctly, it's very difficult to work about long-term memory.</p> <p>For the future centuries, selected information for the future generations is printed on "permanent paper" every 5 years: 1 copy for National Archives and 1 copy for the disposal facility. Actually, for Andra, digital technologies and databases are not a good solution for the long term. Indeed, they are technological changes every ten or twenty years.</p>	
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Question 2:

Do these priority proceed from good practice or/and from specific laws, regulations, policies exist in your country that set out requirements for long-term memory in long-term waste management?

Finland	Hungary	Korea
<p>Our Government Decrees includes the following provisions: “A record shall be maintained of disposed waste, including waste package specific data on the waste type, radioactive materials, location within the waste emplacement room, and other necessary data. The Radiation and Nuclear Safety Authority (STUK) shall arrange the permanent recording of information concerning the disposal facility and disposed waste. An adequate protection zone shall be reserved around the disposal facility as a provision for the prohibitions on measures referred to in paragraph 6, section 63(1) of the Nuclear Energy Act. The Radiation and Nuclear Safety Authority (STUK) shall report the disposal site of nuclear waste and the prohibition on measures, referred to in paragraph 6 of section 63(1) of the Nuclear Energy Act, so that they can be entered in the real estate register, land register or list of titles.”</p>	<p>The Hungarian priorities above can be derived from the following requirements in the relevant Hungarian regulations and from the „good practices” followed by the Hungarian WMO, the Public Agency for Radioactive Waste Management (PURAM): decree 62/1997. (XI. 26.) IKIM on the Geological and Mining Requirements for the Siting and Planning of Nuclear Facilities and Radioactive Waste Disposal Facilities ... Section 3. Investigation of Geological Suitability (1) The method of investigating the geological environment shall be geological research. In the course of the geological research the following points shall be enforced: ... c) the best methods and technologies which are technically and economically attainable shall be employed; d) data shall be stored and shall be able to be reproduced; ... (2) The geological data required for a complex safety assessment shall be determined in the course of the geological research. ... Section 10. Quality Control (1) During the planning of the geological research, a quality control system shall be developed and such system shall be implemented during execution of the research. (2) The following are key elements of quality control: ... f) any data gathered or used in the research shall be stored in a uniform database. The parties conducting the research are entitled and obligated to use that part of the uniform database which is required for their work; g) measurements and data gathered during research shall be stored until decommissioning or closure of the facility or conclusion of the institutional control. ... decree 47/2003 (VIII. 8.) ESZCSM of the Minister of Health, Social</p>	<p>For Wolsong LILW Disposal Center located in Gyeongju, the institutional control period is suggested as up to 100 years after site closure. Before site closure, KRMC will establish the institutional control plans including long-term memory according to the Radioactive Waste Management Law.</p>

	<p>and Family Affairs on certain issues of interim storage and final disposal of radioactive wastes, and on certain radiohygiene issues of naturally existing radioactive materials concentrating during industrial activity</p> <p>...</p> <p>Section 2 Concerning the application of this decree:</p> <p>...</p> <p>(c) <i>safety report</i>: means the documentation summarizing the results of the safety assessment, constituting the basis for licensing;</p> <p>...</p> <p>Section 9 ...</p> <p>(1) Operating license for interim storage facility could be issued only for determined duration, for 5 years at most, which – in case of meeting the operating conditions – can be extended for request repeatedly for 5 years at most.</p> <p>...</p> <p>Section 12 (1) Operating license for final waste disposal facility could be issued for determined duration, for 10 years at most, which – in case of meeting the operating conditions – can be extended for request repeatedly for 10 years at most.</p> <p>...</p> <p>Section 14 ...</p> <p>(13) The design of the storage facility (including the geographical co-ordinates of the site) and the records of the stored waste shall not be discarded.</p> <p>...</p> <p>RAM's Safety Case Supporting Information System based on the existing information systems and applications:</p> <ul style="list-style-type: none"> • Project portals; • Safety Case Supporting Database; • Safety Case Supporting GIS Database; • Safety Case Supporting 3D/4D Database; • Safety Case Supporting Knowledge Base; 	
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	<ul style="list-style-type: none"> • Unified Integrated Reporting System; • Process Controlled Data Uploader. 	
USA	Japan	Canada
<p>Provisions related to memory preservation can be found in statute and regulation:</p> <ul style="list-style-type: none"> • Nuclear Waste Policy Act of 1982, as amended • 40 CFR part 191, “Environmental radiation protection standards for management and disposal of spent nuclear fuel, high-level and transuranic radioactive wastes” • 40 CFR part 194, “Criteria for the certification and re-certification of the Waste Isolation Pilot Plant’s compliance with the 40 CFR part 191 disposal regulations” • 10 CFR part 60, “Disposal of High-Level Radioactive Wastes in Geologic Repositories” • 10 CFR part 63, “Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada” <p>The relevant language from these documents may be found in the attachment.</p>	<p>The Specific Radioactive Waste Final Disposal Act (Final Disposal Act) (Law No. 117, June 7, 2000) defines as follows; Article 18. In the case described in the preceding article, the Organization (NUMO: Nuclear Waste Management Organization of Japan) shall keep a record of the matters specified in the Ordinance of the Ministry of Economy, Trade and Industry (METI) respecting the said final disposal repository, submit it to the Minister of Economy, Trade and Industry, furnish a duplicate copy of the said record at its office, and make it available for public inspection.</p> <p>2. The Minister of Economy, Trade and Industry shall permanently keep the record submitted in accordance with the provisions of the preceding paragraph.</p> <p>The above mentioned Ordinance of METI regarding to the record has not yet been promulgated.</p>	<p>Please refer to the following websites.</p> <p>Policy on Information Management http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=12742</p> <p>Library and Archives of Canada Act http://laws.justice.gc.ca/en/L-7.7/FullText.html</p> <p>As part of its used fuel integrity program, the Nuclear Waste Management Organization has been considering the types of information to be preserved, and options for storing that information, as it relates to the next few decades until such time as the used fuel is transferred to the repository. The NWMO has not adopted official policy on these approaches.</p>
Belgium	France	Sweden
<p>There are no specific regulations setting out requirements for long-term memory in long-term waste management in Belgium.</p> <p>Safeguards related requirements are still to be finalized at IAEA level.</p>	<p>In France, all the guidelines and the rules are issued by Nuclear Safety Authority. :</p> <ul style="list-style-type: none"> • For the “very-low-level disposal facility”, France has no long-term memory need, but just a normal archiving system because the need is just 30 operating years followed by 30 years of monitoring. • For the low- and intermediate-level short-lived disposal facilities, a long-term memory period is prescribed for 3 centuries after the beginning of the monitoring phase. • For the geological disposal facilities, the regulatory guideline recommends 5 centuries after the closure of the facilities. 	<p>There are – so far – no specific regulations in Sweden that set out requirements for long-term preservation of information and knowledge for time scales connected to a final repository for spent nuclear fuel. However, there are safeguard regulations for radioactive materials as well as regulations from the National Archives (receive and preserve records from public administration as well as from private corporations and individuals, and make them available for research) that to some extent are related to the topic of information preservation. SKB has also its own procedures for document management.</p>

		Moreover, the question has been raised and discussed at several occasions. For example there were questions and discussions on the topic during the consultations that were conducted for the Environmental Impact Assessment (EIA) for the final repository for spent nuclear fuel. The question has also been raised by the Swedish National Council for Nuclear Waste.
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Question 3:

How far advanced are you regarding establishing an action plan for long-term information and memory preservation in the field of geological disposal? Are you addressing the following RWMC questions:

What information should be preserved?

- 1) *Why?*
- 2) *Where?*

3) *How should it be preserved?*

4) *Which target groups?*

5) *Which time horizons?"*

Finland	Hungary	Korea
<ul style="list-style-type: none"> • <i>What information should be preserved?</i> STUK's Guide defines in broad terms • <i>Why?</i> For maintaining awareness of the disposed waste • <i>Where?</i> Land use registers, national register of deposits of environmentally hazardous substances... • <i>How should it be preserved?</i> Currently in electronic and paper form, in future - not yet decided • <i>Which target groups?</i> Local population, land use planners, scientific community... • <i>Which time horizons?</i> As long as possible 	<p>PURAM is ready to participate in the establishment of an action plan for long-term information and memory preservation in the field of geological disposal. PURAM has got its own answers to all the above mentioned questions but PURAM does not know if these answers (approaches) are really correct or not.</p>	<p>No answer given</p>
USA	Japan	Canada
<p>The Department of Energy's (DOE) plan for addressing the passive institutional control (PIC) requirements of 40 CFR 191.14(c) in the operation of the Waste Isolation Pilot Plant (WIPP) is described in Appendix PIC of the Compliance Certification Application 1996 (CCA 1996). This plan has existed for over a decade, has served as part of the record in regulatory proceedings, and is subject to continual review and study to improve and update the measures described. Appendix PIC presents the conceptual design for permanently marking the WIPP, establishing records, and identifying other practicable controls to indicate the dangers of the wastes and their location. Consistent with the general priority areas described above, the archived material should include information that is important to defining the location, design, content, and hazards associated with the WIPP. The final plan for implementing PIC measures will be submitted prior to the time of permanent facility closure.</p>	<p>What information should be preserved?</p> <ul style="list-style-type: none"> -Information concerning a repository such as position of the site, waste inventory, lay-out, etc. -History of the development, construction, operation and closure of the repository -Institution framework, regulation -Safety case <p>Why?</p> <p>To prevent possibilities of human intrusion and for a decision making of future generations.</p> <p>Where?</p> <p>IAEA network, domestic country (repository site, local municipalities, central), neighboring countries</p> <p>How should it be preserved?</p> <p>Several medias such as paper, electric media, SiC (Silicon Carbide) media, marker, etc.</p> <p>Both summary and detail information should be preserved.</p> <p>Which target groups?</p>	<p>The Government of Canada does not have a separate nor specific action plan for the long-term information and memory preservation in the field of geological disposal. Information that is deemed long-term information and memory preservation adheres to the Government of Canada's policies and guidelines.</p>

<p>Specific documents identified in Appendix PIC of CCA 1996 to address the requirements of the regulations include:</p> <ol style="list-style-type: none"> 1. The Final Safety Analysis Report and the addenda which describe the disposal phase of the WIPP; 2. The Final Environmental Impact Statement for WIPP and the Supplement(s) to the Environmental Impact Statement; 3. The No-Migration Variance Petition and the No-Migration Determination for Disposal; 4. The Resource Conservation and Recovery Act Permit; 5. The Certification of Demonstration of Compliance with Title 40 CFR 191; 6. Environmental and ecological background data collected during the pre-operational phase of WIPP and summaries of data collected during the disposal and decommissioning phases of WIPP; 7. Records of the waste containers contents and disposal locations within the WIPP repository; 8. Drawings defining the construction and configuration of the repository and shafts; 9. Drawings, procedures, and the design report (s) describing how the waste was emplaced; how the rooms, drifts, and panels were closed; and how the shafts were backfilled and sealed; 10. Detailed maps describing the exact location of the repository; and 11. Design, drawings, specifications, etc. for Permanent Markers. <p>1) <i>Why</i> This information, identified by Appendix PIC of CCA 1996, was chosen to ensure that access to documentation</p>	<p>Various future generations such as policy makers, local people, general public, neighboring countries, etc.</p> <p>Which time horizons?</p> <p>We have the research result that the most important time period will be considered as a thousand of years after closure of a repository. During the period, most radioactivity of HLW will be disintegrated and a container (over-pack or canister) will maintain its integrity.</p>	
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regarding location, potential hazards of intrusion, and land use restriction is readily available.

2) Where

Appendix PIC of the CCA 1996 identified archive locations which includes public funded organizations that can expend the resources necessary to preserve the documents in well controlled environments. However, the most likely strategy for long term protection of the information is through widespread distribution. The DOE stated in Appendix PIC that it will strive to reach agreements for accepting and archiving the documents with the following organizations:

- 1) National Archives and Records Services;
- 2) The State Archives of New Mexico and Texas;
- 3) The national archives of the nations worldwide which possess nuclear weapons and/or operate nuclear power generating plants;
- 4) The archives of the United Nations; and
- 5) The national archives of the world nations which possess natural gas and/or petroleum resources and are not included in the list of nations that have nuclear weapons/nuclear power plants stated above.

3) How should it be preserved?

To ensure the proper storage and retrievability of archived material, the DOE archivist will develop a filing code system specifically for WIPP material. This system will be a part of the overall document submittal DOE will provide to the various archival locations. The paper used to print the submitted documents will be of archival quality. To reduce the possibility that future archivists may destroy the provided documents, each volume containing documents will be labelled with a warning that the intent of providing the

<p>archived material is to ensure its preservation for the 10,000 year regulatory time frame stipulated in the United States Government's regulations controlling the disposal of Transuranic Waste. It is recognized that the Federal Government may incur some long term financial obligations to the archival locations to ensure retention. It is also recognized by the DOE that even with the utilization of archival quality paper and climate controlled environments, WIPP documents may not be able to be preserved for 10,000 years. However, the best known practices will be used in an attempt to retain the WIPP materials for as close to 10,000 years as possible. Within two years following the distribution of archival material and at least every 15 years thereafter during the Active Institutional Controls period, the DOE will conduct audits of selected archival locations to verify retention and retrievability of the historical documents. In addition to document archives, which will include a complete record of the WIPP, site markers and monuments will be established bearing messages and warnings regarding the nature of the site. Information at the site will be conveyed in a hierarchy of complexity (beginning with the knowledge that the site is manmade) and in multiple languages (seven languages are currently contemplated: English, French, Spanish, Russian, Chinese, Arabic, and Navajo).</p> <p><i>4) Which target groups?</i> The receiving record centres will be requested to locate and catalogue this summary volume such that it is readily available to the general public with particular emphasis on availability to potential natural resource investigators, historians, and archaeologists.</p> <p><i>5) Which time horizons?</i> To reduce the possibility that future archivists may destroy the provided documents, each volume containing documents will be labelled with a warning that the intent of</p>		
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<p>providing the archived material is to ensure its preservation for the 10,000 year regulatory time frame stipulated in the United States Government's regulations controlling the disposal of Transuranic Waste.</p>		
Belgium	France	Sweden
<p>In general terms: The (draft) regulatory requirement of a 10 to 15 year safety re-assessment of the disposal facility will be an important element of the disposal facility license process. This will create a mechanism to transfer knowledge and information to future generations via successive safety cases. Institutional measures taken with regards to land use restrictions will be a second mechanism. Regarding the specific questions: For the geological disposal program, nor a plan nor specific action have been set up yet. For the LLW surface disposal program, the main principles are being established, as explained below <i>-What information should be preserved?</i> Files related to the safety assessments, as-built files of the facility, especially the waste characteristics and their location inside the facility, main monitoring results. <i>-Why?</i> Preserve memory of content of the repository. <i>-Where?</i> Several locations: at the site itself + back-up elsewhere. <i>-How should it be preserved?</i> A.o. in paper form ("archival grade paper"). <i>-Which target groups?</i> <i>-Which time horizons?</i> Until the end of the institutional control period.</p>	<p>For the future geological facilities, the same thing will apply as for our surface facilities. Indeed, we have 5 centuries required after closure. However, should the memory of the facility be preserved beyond societal requirements? Some solutions exist. For example, micro-engraving for 5,000 years, surface markers for 25,000 years and a platinum/sapphire disc for 2,000,000 years. Another question: is it sensible to keep memory over long timescales? What "industrial memory" have we kept of the past? What heritage have we found in and kept from the past? Since around 50,000 years we retrieved drawings, structures, objects...Before, we only retrieved bones and fossils. However, still many questions remain to memorize for millenniums and more. For examples: <ul style="list-style-type: none"> • Which evolutions will there be for humans? Their organization? Their environment? Etc. • Which will be the needs in this future? What information to preserve for this future? Etc. • Which languages is it pertinent to write? Which drawings, symbols or markings is it pertinent to make? Etc. • How to avoid vandalism? Where to find the data? Etc. • What meaning will future generations associate with those traces? Etc. • How to transmit from generation to generation during all this time? Etc. It will be a very long way to answer at these questions...</p>	<p>SKB has not yet adopted an action plan for long-term information and memory. However, SKB has conducted a number of studies (e.g. Bowen-Shrire et al., 2008) that initiated discussions on an action plan. The results of the studies have been further discussed within SKB. 1) In the long term, information should be preserved in order to: <ul style="list-style-type: none"> • Avoid damage by accident • Allow for our generation and future generations to make decisions based on knowledge. Facilitate for possible future need for technical improvement or repair of the repository. Facilitate for the possible future desires to retrieve the spent fuel or use the site. • Inform about the existence of the final repository, its location, the properties of the waste and how to handle it. In the short term: <ul style="list-style-type: none"> • To manage today's knowledge and information so that the long term goals can be reached. 2) Redundancy is important for the storage and preservation of information. It should be preserved/stored at different locations; in local, national and international archives, in connection to the repository as well as in well-known places worldwide. 3) Redundancy is again important concerning the methods/media for the preservation/storage. Information should be preserved in different format, language and medium. Different forms of preservation include established archives, markers in the landscape and collective memory.</p>

		<p>4) Potential target groups are: planners and developers of new facilities (e.g. mines), politicians, decision-makers, waste management companies, energy companies, scientific community, members/representatives of the public, nearby residents.</p> <p>5) Please see the answer to question 1. Rather than defining strict time scales, SKB has found it more relevant to work with different scenarios of continuity/discontinuity in the process of information/knowledge transfer.</p>
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Question 4:

What suggestions do you have for possible areas of focus for RWMC? (e.g. an international project that may assist Members?) What are the untapped areas that deserve more attention?

Finland	Hungary	Korea
<p>Studies on the topic have been made earlier, e.g. see the reference below.</p> <p>Revisiting some of the issues would be desirable; e.g. can modern information technology provide robust means to convey information for future generations, i.e. in a form which is available and understandable to the target groups.</p>	<p>State of the art report about</p> <ul style="list-style-type: none"> • legal background of long-term preservation of information and memory • knowledge management tools and technologies used in radioactive waste management. <p>It would be useful to compile a guide about this matter in reflect of the international practice. It would be useful to organize a workshop related to the state of the art report.</p> <p>Within the scope of this work it would be expedient to sum up</p> <ul style="list-style-type: none"> • the set of information used for the safety assessment, • how these information should be arranged in groups, to determine metadata which are necessary for the long-term preservation of information used in the safety assessment stages, and • how the wrong determination of metadata can influence the reproducibility, transparency, traceability and the long term preservation of information, • how the stakeholders (authorities, experts, inhabitants, ...) have relation to the use of several decade old information in safety assessments, 	<p>No answer given</p>

	<ul style="list-style-type: none"> • what is the good practice to integrate knowledge from multiple sources, • organisational issues of long term information management, • contracting issues of handing over information to waste management organisation from subcontractor, • how can we be convinced of completeness of the made over information. 	
USA	Japan	Canada
It is of the utmost importance that archival of these types of records be uniform worldwide. Descriptions, how records are archived, the type of records to archive, availability of the records, etc. must be uniformly completed and be identical throughout the worldwide archival system. It may also be useful to consider a uniform system for markers and information/library facilities, so that they would be recognized wherever encountered (e.g., the standard trefoil design). The role of international organizations in establishing and locating information archives may be extremely important.	Over-all study is needed.	It will be very important to actively seek the advice, guidance and participation of archivists in this project. Archivists are knowledgeable and have a lot of expertise with respect to the issue of long-term memory and development of information. It will also be important to engage the community of information management specialists in this project. This is a topic of interest to all of us and any international recommendations that can provide guidance would be greatly appreciated.
Belgium	France	Sweden
Practical limitations. Practical implementation of safeguards requirements (when defined). Latest developments in the field of archival grade paper and preservation.	Andra has several proposals for international memory cooperation: <ul style="list-style-type: none"> • In first proposal, a ten-year periodic review of our long-term memories of surface repositories for the adequacy of future generations needs (CSM in 2012, then every 10 years). Why not a kind of “laboratory” to test process improvement from feedback? • In second proposal, creating a common Internet 	Possible focus areas are: <ul style="list-style-type: none"> ◦ What data/information should be preserved at different phases (see answer to question 1)? ◦ How to design and formulate messages that can be understood (by coming generations as well as in the long term)? ◦ How, where and when is it relevant/possible to establish international archives? ◦ What medium already exists for preservation of information and what

	<p>site for sharing information on the memory.</p> <ul style="list-style-type: none"> • In third proposal, creating a study group on the different needs for very-long-term memory (millennium and more) to investigate different approaches for solutions. • In fourth proposal, sharing of thoughts for all or part of the project of memory centers as seen before. <p>However, all these actions require a prior assumption. For present and future facilities, document and record management, configuration management and knowledge management must be operational and at a good level. Otherwise it is not possible to build long-term memory. So, what about creating a group to exchange good practice in these fields?</p> <p>In final, Andra proposes to establish a steering group on the long-term memory whose aims would be:</p> <ul style="list-style-type: none"> • To propose topics of study at RWMC. • To organize periodic exchanges to explore these topics. • To report progress periodically and suggest new topics to RWMC (every 2 years for example). 	<p>are the prospects in this field of research?</p> <ul style="list-style-type: none"> ◦ How to establish a clear responsibility for collection, updating and revision of information?
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Question 5:

Would you have studies, research, reports, policies that you might share with RWMC members?

Finland	Hungary	Korea
<p>A joint Nordic study report: "Conservation and Retrieval of Information - Elements of a Strategy to Inform Future Societies about Nuclear Waste Repositories". Nordiske Seminar og Arbejdsrapporter 1993:596. For getting an electronic version, contact project leader Mikael Jensen/SSM.</p>	<p>There are some documents concerning the long-term memory preservation in long-term waste management which are only available in Hungarian.</p>	<p>No answer given</p>
USA	Japan	Canada
<p>The following is a list of references cited in the WIPP CCA 1996.</p> <p>Ahlen, J.; Ferguson F.; Jackson, D.; McVay, T.; Scott, L.; Sexton, J.; Wilson D.; Lewis P.; Brian, J.; Fowler, B.; 1995. Analytical Study of an Inadvertent Intrusion of the WIPP Site, WIPP Inadvertent Intrusion Advisory Panel and New Mexico Junior College, September 5, 1995.</p> <p>Bachman, G.O. 1985. Assessment of Near-Surface Dissolution at and near the Waste Isolation Pilot Plant (WIPP), southeastern New Mexico. SAND84-7178. Sandia National Laboratories, Albuquerque, NM.</p> <p>Bechtold, S.L. 1996 correspondence. National Archives and Records Administration (NARA) Bulletin No. 95-7, September 8, 1995.</p> <p>Bellus, Peter A.: Jerome Eckerman. August 1994. Airborne or Spaceborne Surveillance radar detection of WIPP Site.</p> <p>Birkeland, Peter W. 1984: Soils and Geomorphology.</p> <p>Hora, Stephan C. 1991. Expert Judgment on Inadvertent Human Intrusion into the Waste Isolation Pilot Plant. SAND90-3063 UC-721. December 1991.</p>	<p>Please see the references.</p> <p>References;</p> <p>Radioactive Waste Management Funding and Research Center (RWMC) 2003. Record Preservation Study on Geological Disposal –Significance and Technical Feasibility-, RWMC TECHNICAL REPORT RWMC-TRE-03001, RWMC. http://www.rwmc.or.jp/library/pdf/RWMC-TRE-03001.pdf</p> <p>Radioactive Waste Management Funding and Research Center (RWMC) 2008. Durable Media for Long-Term Preservation of Geological Repository Records, K. Aoki, N. Fujii, H. Kageyama, K. Yoshimura, J. Ohuchi, T. Tsuboya, WM2008 Conference, February 24 -28, 2008, Phoenix, AZ.</p>	<p>Directive on Information Management Roles and Responsibilities http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=12754</p> <p>Directive on Recordkeeping http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?section=text&id=16552</p>

<p>Jensen, Mikael. 1993. Conservation and Retrieval of Information -Elements of a Strategy to Inform Future Societies about Nuclear Waste Repositories. Final Report of the Nordic Nuclear Safety Research Project KAN - 1.3. August 1993.</p> <p>Kaplan, Maureen F. 1982. Archaeological Data as a Basis for Repository Marker Design. ONWI-354 UC-70. October 1982.</p> <p>Krefta, M. August 1994. Personal memorandum to T. Mallick titled Magnetic field calculations for WIPP magnetic markers.</p> <p>Mallick, Ted. August 1994. Personal memorandum to J. Iacovino titled WIPP Magnetic Markers.</p> <p>Nowak, E. J.; Tillerson, J. R.; Torres, T. M. 1990. Initial Reference seal System Design: Waste Isolation Pilot Plant. SANDSO-03550UC -721. May 1990.</p> <p>Swift, P.N. 1992. Long-Term Climate Variability at the Waste Isolation Pilot Plant. Southeastern New Mexico. USA. Environmental Management. SAND91-70550UC-721. November 1992.</p> <p>Tolan, Terry L. 1993. The Use of Protective Barriers to Deter Inadvertent Human Intrusion Into a Mined Geologic facility for the Disposal of Radioactive Waste: A Review of Previous Investigations and Potential Concepts. SAND91-7097 UC-721. June 1993.</p> <p>Trauth, Kathleen M.; Hora, Stephen C.; Guzowski, Robert V.; 1993. Expert Judgement on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant. SAND92-1382 UC-721. November 1993.</p> <p>Weitzberg, Abraham. August 1982. Building on Existing Institutions to Perpetuate Knowledge of Waste Repositories. ONWI-379 UC-70.</p>		
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<p>WP 02-9, Revision 0, WIPP Final Safety Analysis Report, May 1990.</p> <p>In addition, during its rulemaking for 40 CFR parts 194, EPA convened expert panels to discuss the proposed measures on passive institutional controls. It may be possible to provide information from these sessions.</p>		
Belgium	IAEA	France
<p>Nothing available for the time being.</p>	<p>IAEA-TECDOC-1222: Waste inventory record keeping systems (WIRKS) for the management and disposal of RW, published in June 2001, available on http://www-pub.iaea.org/MTCD/publications/PDF/te_1222_prn.pdf</p> <p>IAEA-TECDOC-1519: Data Requirements and Maintenance of Records for Spent Fuel Management: A Review, published in 2006</p> <p>IAEA-TECDOC-1097: Maintenance of Records of Radioactive Waste Disposal, Vienna(1999)</p> <p>IAEA-TRS-467: Long Term Preservation of Information for Decommissioning Projects, published in 2008</p> <p>IAEA-TECDOC-1548: Retrieval, Restoration and Maintenance of Old Radioactive Waste Inventory Records, published in 2007</p> <p>IAEA-TECDOC-1398: Records for Radioactive Waste Management Up to Repository Closure: Managing the Primary Level Information (PLI) Set, Vienna (2004)</p> <p>IAEA Safety Standards Series No. GS-G-1.4: Documentation for Use in Regulating Nuclear Facilities, Vienna (2002)</p> <p>IAEA Safety Standards No. GS-R-3: The Management System for Facilities and Activities, Vienna (2006)</p>	<p>It's possible to share the studies done in the recent past and the studies scheduled for the next years.</p> <p>Andra has done 2 studies in 2008/2009:</p> <ul style="list-style-type: none"> • First, the durability of the solution “toner / permanent paper” according to several standards. • Then scientific studies about the most important criteria of this solution. <p>For this year Andra has two projects:</p> <ul style="list-style-type: none"> • First, the manufacturing of a sapphire disk with platinum incrustation. • Second, the manufacturing of micro-etching plates. <p>These two projects are only to make demonstrators of very long-term solutions.</p> <p>For the next ten years Andra hope to build long-term memory centers:</p> <ul style="list-style-type: none"> • Preservation center for animal and plant biodiversity. This center has been decided and will be built near the underground laboratory. • Preservation center for geological samples. • Center for the international records of radioactive waste sea dumping. This center can be an international center. • Center for archives and memories of facilities and research about support and language. • Center for modern art contributions to the long-term memory. • Museum for technologies used in the disposal of radioactive waste during around two centuries. <p>In these above centers or at the head office of Châtenay, studies with French and international specialists on will take</p>

		<p>place:</p> <ul style="list-style-type: none"> • Languages or useful symbols (permanence, understanding, sense...). • Useful support to write, engrave or mark (permanence, understanding, sense...). • Archaeology and landscape archaeology where the landscape becomes memory (sense...). • Cognitive processes and transmission through the generations. • Institutional conservation of writings, sounds, pictures, objects (permanence, sense ...). • Perception of the very big ladders of time (philosophy, sociology ...). • Involvement of the local populations (taking over of the storage and its memory). • Etc.
Sweden		
<p>Bowen-Shrire M, Eckerhall D, Jander H, Waniewska K, 2008. Bevarande av information om slutförvar för använt kärnbränsle – förslag till handlingsplan. [Keeping information on the repository for spent nuclear fuel – draft action plan.] SKB P-08-76, Svensk Kärnbränslehantering AB [in Swedish, summary in English].</p> <p>Bowen-Shrire M, Jander H, Waniewska K, 2007. Kunskapsbevarande för framtiden – Fas 1. [Knowledge Preservation for the Future – Phase 1.] SKB P-07-220, Svensk Kärnbränslehantering AB [in Swedish, summary in English].</p> <p>Bandolin G, Sörlin S, 2007. Laddade landskap – värdering och gestaltning av teknologiskt sublimes platser. [Loaded landscape – valuation and design of technologically sublime places.] SKB R-07-14. Svensk Kärnbränslehantering AB [in Swedish].</p> <p>Johansson P, Lisberg Jensen E, 2006. Identitet och trygghet</p>		

<p>i tid och rum – kulturteoretiska perspektiv på kärnavfallsfrågans existentiella dimensioner. [Identity and security in time and space - cultural theory perspective on nuclear waste issue existential dimensions.] SKB R-06-119, Svensk Kärnbränslehantering AB <i>[in Swedish]</i>.</p> <p>Eng T, Norberg E, Torbacke J, Jensen M, 1996. Information, Conservation and Retrieval. SKB TR 96-18. Svensk Kärnbränslehantering AB <i>[in English]</i>.</p> <p>KAN-1.3 is a project within the NKS programme (Nordic Nuclear Safety Research), in the subarea Nuclear power waste and decommissioning (Kärnkraftens Avfall och Nedläggning – KAN). The project examined the issue of preservation of information relating to a repository for radioactive waste, by investigating what information should be preserved regarding both content and form, and how information can be protected by identifying possible threats and strategies against such threats. A series of background papers addressing various sections of the field of information preservation was also presented. Published report can be downloaded at www.nks.org.</p>		
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