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## PROJECT PRESENTATION (PP)

# Long-term Performance of Engineered Barrier Systems PEBS

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## DELIVERABLE (D-N°:D5-1)

**Author(s):**

**Michael Mente**

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### Dissemination Level

<b>PU</b>	Public	PU
<b>RE</b>	Restricted to a group specified by the partners of the PEBS project	
<b>CO</b>	Confidential, only for partners of the PEBS project	

[PEBS]



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Dissemination level : -

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## Project information

**Website address:** pebs-eu.de (available at November 2010)

**Project type** (funding instrument):

**Project start date:** 01/03/2010

**Duration:** 48 months

**Total budget:** EUR 6.525.008,80

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**EC project officer** (name, address, email):

Christophe Davies

European Commission

Directorate-General for Research

Directorate Energy (Euratom)

Unit J.2 – Fission

CDMA ../...

B-1049 Brussels

Email: Christophe.Davies@ec.europa.eu

**Coordinator:** Michael Mente, Federal Institute for Geosciences and Natural Resources,

Stilleweg 2, D-30655 Hannover, Germany

Tel. +49-511-643.2246, fax: +49-511-643.3694 , michael.mente@bgr.de

### Partners:

Partner number	Partner full name	Short name	Country code (2-letter ISO code*)
1	Bundesanstalt für Geowissenschaften und Rohstoffe	BGR	DE
2	Nationale Genossenschaft für die Lagerung radioaktiver Abfälle	NAGRA	CH
3	Svensk Kärnbränslehantering AB	SKB	SE
4	Gesellschaft für Anlagen- und Reaktorsicherheit mbH	GRS	DE
5	Empresa Nacional de Residuos Radioactivos SA	ENRESA	ES
6	Asociacion para la Investigacion y el Desarrollo Industrial de los Recursos Naturales	AITEMIN	ES
7	Centre Internacional de Mètodes Numèrics en Enginyeria	CIMNE	ES
8	University of La Coruna	UDC	ES
9	Centro de Investigaciones Energéticas Medioambientales y Tecnológicas	CIEMAT	ES
10	Agence Nationale pour la Gestion des Déchets Radioactifs	ANDRA	FR
11	Universidad Autonoma de Madrid	UAM	ES
12	DM Iberia S.A.	DM Iberia	ES
13	Solexperts AG	Solexperts	CH
14	TK Consult AG	TKC	CH
15	Clay Technology	Clay Technology	SE
16	Beijing Research Institute for Uranium Geology	BRIUG	CN
17	Japan Atomic Energy Agency	JAEA	JP

\* List of country codes: <http://publications.europa.eu/code/en/en-5000500.htm#ia5>

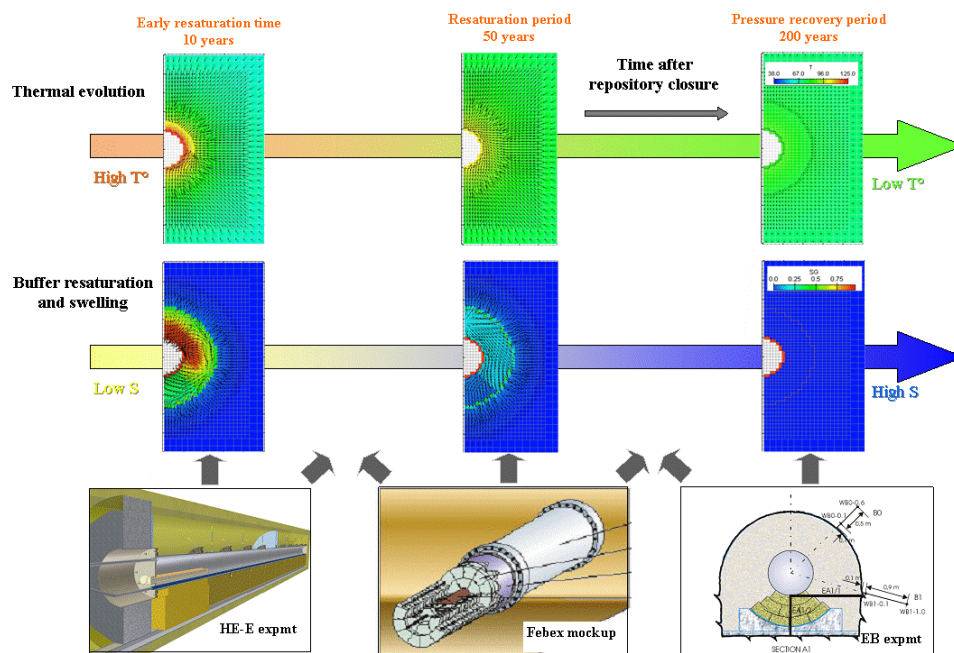
## Introductory paragraph

Nuclear power plants produce heat-generating radioactive waste that has to be disposed very careful. For such a disposal various natural and technical barriers will be used. The PEBS project concentrates on the construction and the analysis of the technical clay barriers. For such analysis also technical experiments in an underground lab will be performed. Models for long-time forecasts will be developed. Results from in-situ experiments and modelling will be compared and calibrated stepwise to achieve reliable information.

### 1. Nature and scope of the project

The consortium includes main European implementing organisations, experienced modellers, universities, Bentonite experts, researchers, mining experts, technology and innovation centres and international partners to provide a global know-how transfer. In the recent past nearly all partner are involved in various projects such as FEBEX or EURATOM NF-PRO and ESDRED. The project will be observed by an international High Level Expert Committee.

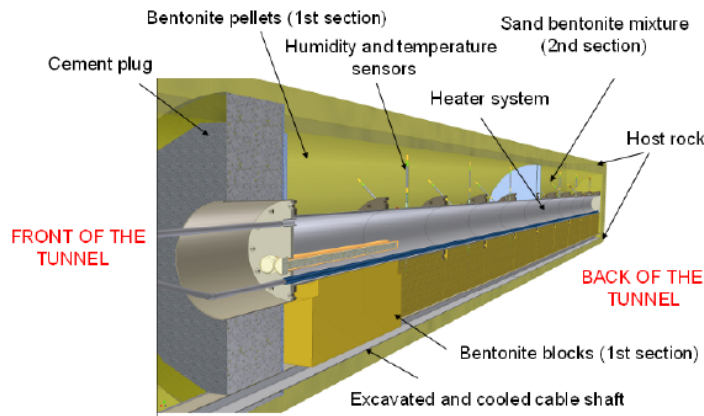
The project PEBS aims at the evaluation of sealing and barrier performance of the Engineered Barrier System for final storage of heat-generating radioactive waste through the development of a comprehensive approach involving experiments, model development and consideration of the potential impacts on long-term safety functions. The experiments and models cover the full range of conditions from initial emplacement of wastes through to later stage establishment of near steady-state conditions, i.e. full resaturation and thermal equilibrium with the host rock (see following Fig.).



### 2. Activities

PEBS includes five RTD and additionally Dissemination and Project Management Work Packages. The RTD Work Packages include i) Analysis of system evolution during early post closure period and the Impact on long-term safety functions, ii) Experimentation on key engineered barrier systems, processes and parameters, iii) Modelling of short-term effects and extrapolation to long-term evolution, iv) Analysis of impact on long term safety and v) Comparison of approaches between Europe and China.

Various tests in an underground lab (see next Fig.) and in technical laboratories will be conducted. Under the impact of heat (T), pressure (M), water (H) and chemical reactions (C) the behaviour of clay has to be analysed. Coupled HM, THM and THMC analyses will be performed.



PEBS will review recent advances in the current state-of-the-art affecting the processes in the early evolution of barriers and its treatment in performance assessment, in particular the relationship to EBS safety functions. This will clarify the needs for additional laboratory and field experiments targeted at supporting assessments of normal and altered evolution scenarios. Good quality and reliable experimental data bases for HM, THM and THMC processes, including different time and spatial scales for various models and a synthesis will be provided. Experimental data and calibrated process models for extrapolation to long-term evolution of the repository EBS will be used for normal and altered scenarios. Finally PEBS will relate the experimental and modelling results and uncertainties to the long-term safety functions of the repository components and to the overall long-term performance of the repository, giving feedback and guidance for the repository design and construction.

In addition to the scientific-technical aim, the PEBS consortium will spread the essential results to the broad scientific community within and outside the EU. The consortium will use its expertise for public information purposes and promote knowledge and technology transfer through training. Work Package 5 brings together all activities concerning dissemination and training.

### 3. Expected results

Definition of important processes and scenarios during the early evolution of the barrier and its effects on long-term performance and safety functions of the repository. On the base of these processes various experiments will be performed to provide with a reliable good quality experimental data base, including different time and spatial scales, as input to the modelling and extrapolation work for long-term evolution and to investigate model uncertainty and its impact on long-term prediction.

On the base of information developed from various experiments and models related to the evolution of the barrier a synthesis of what significance the work has for showing how the barrier and near-field rock will behave both during and after the transient period will be developed. The study will make use to the extent possible of on going experiments in China.

### 4. Societal impact

National repository designs under development in the EU put strong emphasis on the containment properties of the Engineered Barrier System and the near-field of a geological repository for heat-generating waste disposal. Building confidence in the barrier performance of the EBS and containment function of near-field will therefore contribute to the acceptance of nuclear power as an essential component of the energy mix within the EU.

### 5. Information about important public events

Exploitation and dissemination of results on European level includes a clay lab training course inclusive a related workshop and a scientific excursion to a bentonite mine, two workshops only for Regulatory Authorities to discuss first results and further steps for the ongoing project as well as the specific impacts on licensing and agencies matters and the final workshop to present and discuss the PEBS results. More details can be found on the project website.