

Background

SCK•CEN started to study the Boom Clay as potential host rock for nuclear waste disposal in 1974. Since then, SCK•CEN has been involved in other international projects studying clay as potential host rock in order to get a broader support for disposal in clay and to acquire broader insight in clay behaviour. Besides Belgium, France and Switzerland are currently investigating clay formations as potential host rock for the disposal of radioactive waste. In the Netherlands, clay formations have always been considered as an alternative to disposal in salt. The general interest in clays is increasing: in Germany and The United Kingdom, it was decided a few years ago that besides respectively salt and crystalline rock also clays need to be evaluated. In Eastern and Central Europe, the Slovak republic and Lithuania consider both clay and granite as possible host rocks for spent fuel while in Russia recently a project was started to study the possible disposal of low and medium level waste in a clay formation in the Leningrad area. Within the EC R&D framework programs and the OECD/NEA Clay Club, collaborations were developed between countries studying clay and with a strong involvement of SCK•CEN. The collaboration with the Eastern and Central European countries is supported through the support programme of the Belgian Ministry of Economic affairs.

Objectives

- To deliver expert services to other nuclear waste disposal programs considering clay as host rock;
- To acquire broader international recognition of our expertise and support for the development of nuclear waste disposal in clay;
- To get a broader insight in the properties and behaviour of clays.

Principal results

SCK•CEN was one of the founding members of the Mont Terri Consortium. This consortium was established in 1996 and is in charge of the exploitation of the Mont Terri Underground Research Facility, which is located in the Opalinus Clay at Sankt Ursanne, Switzerland. As part of the Mont Terri project, SCK•CEN adapted and applied its *in situ* techniques for the measurement of the porewater pressure (Figure 1) and hydrogeochemical characterisation to an indurated hard clay. Observations concerning e.g. excavation induced fracturing, anisotropy, microbial activity, derived from experimental work in the HADES underground research laboratory in Mol were confirmed in Mont Terri. This shows that, despite differences between the plastic Boom Clay and the Opalinus indurated clay, many mechanisms are similar and transferable.



Figure 1 Adaptation of porewater pressure measurement equipment to stiff clay using packers

Since the underground laboratory in the indurated Callo-Oxfordian clay at Bure in France, has become available, SCK•CEN experts have acted as advisors to ANDRA for the *in situ* experiments concerning radionuclide migration. Recently this activity was extended to radioactive waste behaviour and corrosion experiments. Many similarities in the governing mechanisms could be demonstrated.

In the Slovak Republic, SCK•CEN advised the Slovak Geological Survey on a first evaluation of the Secen Schlier, a 600 m thick silt-claystone formation, as potential host rock for spent fuel disposal. This evaluation showed that it is very likely that transport through this formation is dominated by a slow diffusion process. Accordingly, it is worthwhile continuing investigations on this formation as potential host rock.

In Lithuania, SCK•CEN provides assistance and advise to the Geological Survey and the Nuclear Waste Agency RATA in the selection of a suitable clay formation(s) for geological disposal of nuclear waste near the site of the Ignalina NPP in N-E Lithuania.

In Russia SCK•CEN supports RADON St. Petersburg (Figure 2, 3) in assessing the suitability of the same clay formation as in Lithuania for the geological disposal of low and intermediate level waste. An interesting feature here is that these clays display characteristics similar to the Boom Clay despite the fact that these clays have undergone severe loading-unloading cycles during the last ice ages.

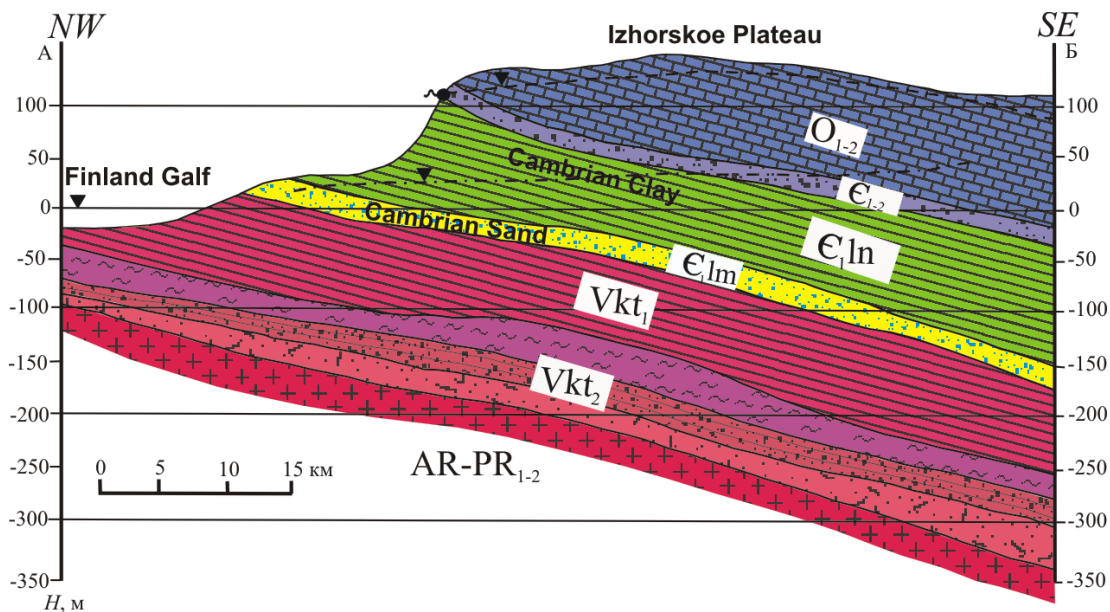


Figure 2: Geological cross-section close to RADON Sosnovybor (Saint Petersburg) with indication of the Cambrian clay studied as potential host rock



Figure 3: Core drilling and preparation of clay cores at RADON Sosnovybor (Saint Petersburg) (Figure 2 & 3 taken from V.G. Rumynin, et al. Research of Vendian and Cambrian clays as a medium for construction of a regional waste repository in N-W region of the Russian federation, The II International Forum, October 02-05 2007, Saint Petersburg)

Future developments

SCK•CEN will continue its activities in France, Switzerland, Lithuania and Russia in order to develop further our basis of comparison with the Boom Clay and extend our international recognition as "disposal in clay" experts.

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Main reference

M. Hugi, P. Bossart and P. Hayoz (eds.), "Mont Terri Project, Proceedings of the 10th Anniversary Workshop", 16-17 May 2006, St-Ursanne, Switzerland, No. 2 Swiss Geological Survey, 2007, swisstopo, Wabern, Switzerland