



LUCOEX project Newsletter 1/2012

The Large Underground Concept Experiments “LUCOEX” project focuses on developing solutions for underground disposal of nuclear waste. The project was started in 2011 and is implemented in collaboration with a consortium of Posiva Oy (Finland), Svensk Kärnbränslehantering AB (“SKB”) (Sweden), Agence nationale pour la gestion des déchets radioactifs (“Andra”) (France) and Nationale Genossenschaft für die Lagerung radioaktiver Abfälle (“Nagra”)(Switzerland). The project is partly financed by the European Union’s EURATOM programme.

This newsletter summarizes the progress made in the project for respective Work Package during 2011, and presents an outlook for 2012. The project has during 2011 mainly been in the planning phase. During 2012 the large scale underground demonstrations will start.

LUCOEX project WP1 and WP6 Newsletter 1/2011

During 2011 WP1 and WP6 has formed the administrative base for the project. This has included writing of project plan, common project risk list, communication plan, staff secondment plan, scholarship plan, scholarship terms of reference and expert group terms of reference. A project internal webpage at “Projectplace” and an external webpage at www.lucoex.eu have been established. The external webpage provides information on, and possibilities to apply for, LUCOEX scholarships. All public deliveries will be published at the external webpage.

The steering committee has had four meetings to establish and start up the project organization.

An expert group has been formed. In accordance with the requirement in the grant agreement it consists of four “internal” experts from the LUCOEX consortium and four “external” experts. The expert group is lead by Jean Michel Bosgiraud from Andra.

Internal Experts

Chair: Jean Michel Bosgiraud (Andra)
Thomas Fries (Nagra)
Stig Pettersson (SKB)
Jere Lahdenperä (Posiva)

External experts

Alan Hooper
Wilhelm Bollingerfehr (DBE)
Geert Volckaert (SCK-CEN)
Lumir Nachmilner

As a part of the work with European added value the LUCOEX project has invited other EU countries to participate in the dissemination of the project results. So far organisations from Bulgaria, Poland, Slovakia, Belgium and Germany have reported interest to follow the project.

During 2012 two Project progress meetings will be held in Bure, France, and Olkiluoto, Finland. In conjunction with those meetings workshops on specific technical themes will be held. A mid-term workshop will be held in October in Montpellier, France.

LUCOEX project WP2 Newsletter 1/2011

Nagra is responsible for Work Package 2, FE-Experiment, "Full Scale Emplacement" Experiment at Mont Terri rock laboratory in Opalinus Clay host rock. This experiment aims at confirmation of the suitability of repository concept by constructing an emplacement tunnel, manufacturing bentonite

buffer units, manufacturing test equipment for waste and buffer emplacement and demonstrating installation performance.

Activities in 2011

The main activity in the year 2011 was the preparation work for the future excavation of the 50 m long test tunnel. For this, a start niche of 8.4 m length, 9.6 m width and approximately 7 m height was constructed and lined with shotcrete and steel ribs. From this niche, 10 observation boreholes up to 55 m length were drilled around the future test tunnel, geologically described and instrumented.

Work has also been done on the development of buffer material and bentonite emplacement equipment.

Plans for year 2012

LUCOEX WP2 main activity in 2012 will be the construction of the test tunnel of 50 m length at Mont Terri rock laboratory. The tunnel will be excavated with a diameter of 3.0 m and lined with two different tunnel supporting systems, low pH shotcrete liner and steel ribs. After finishing the tunnel construction work in late summer 2012, the tunnel will be ventilated for at least one year.

Further work will be done for the characterization of the bentonite buffer material and the development of the emplacement equipment, focusing on mock-up tests and detailed emplacement machine design.

LUCOEX project WP3 Newsletter 1/2011

Andra is responsible for Work Package 3, ALC (sleeved cell) Full scale emplacement experiment, in Bure. This experiment aims to study the behaviour of a HLW cell under thermal loading by simulating the heat produced by waste packages. The aim is both to demonstrate production and operation of a “HLW cell” and to understand the TM behaviour of the sleeve and the THM behaviour of the neighbouring rock.

Test of forced casing digging (“insert”)

In the current design, the HLW cell head has a metal sleeve called “insert”. This insert, with a diameter slightly bigger than the one of the sleeve for the useful part of the cell (where the waste packages are placed), allows the sleeve to slide freely inside the insert, thus absorbing its thermal extension (due to heating by the exothermic packages), without consequences (such as thrust effects) for the cell head as a whole. A production test of a cell head with a 10 m insert was performed in June 2011, with an excavation diameter of 791 mm, an insert thickness of 35 mm and an annular space of 8 mm. After 7.5 m of excavation, the thrust forces required to install the insert reached the maximum capacity of the machine (160 tonnes), and the excavation was stopped. Consequently, the insert configuration will be modified for the ALC experiment to minimise the risk of insert jamming during excavation: the length of the cell head will be set at 6 m, with an annular space of 12 mm.

Development of sleeve/insert instrumentation and of heaters

The conception of sleeve and insert instrumentation is currently being implemented, in relation with the conception of the heaters. Indeed, as the heaters will be put in place after the instrumentation of the sleeve and the insert, both conceptions must interact with each other to avoid any damage during installation.

A test of installation procedures involving staff operations inside a 40 m long cell for sleeve instrumentation installation has been done with success in October 2011. These procedures will thus be re-used for the ALC experiment.

Plans for the year 2012

LUCOEX WP3 activities in 2012 will include the finalisation of instrumentation and heaters conception, manufacturing of equipment, realisation of preliminary installation tests at ground level, and finally excavation and equipment of the HLW demonstration cell.

LUCOEX project WP4 Newsletter 1/2011

Background

The Swedish reference design is KBS-3V employing vertical disposal of the waste canisters. Horizontal disposal of the canisters, KBS-3H, is a possible alternative. KBS-3H has been developed since the late 90's as a joint undertaking by SKB and Posiva. The main goal of this project phase is to elevate KBS-3H design and system understanding to such a level that preparation of a preliminary safety evaluation for KBS-3H and a comparison between KBS-3V and KBS-3H can be made possible.

The Multi Purpose Test

One significant step in reaching the System Design level is the so called Multi Purpose Test (MPT) which is planned to be carried out at the Äspö HRL during 2011-2014.

The test is basically a non-heated installation of the reference design, DAWE, of short duration, including the main KBS-3H components, see Figure 1.

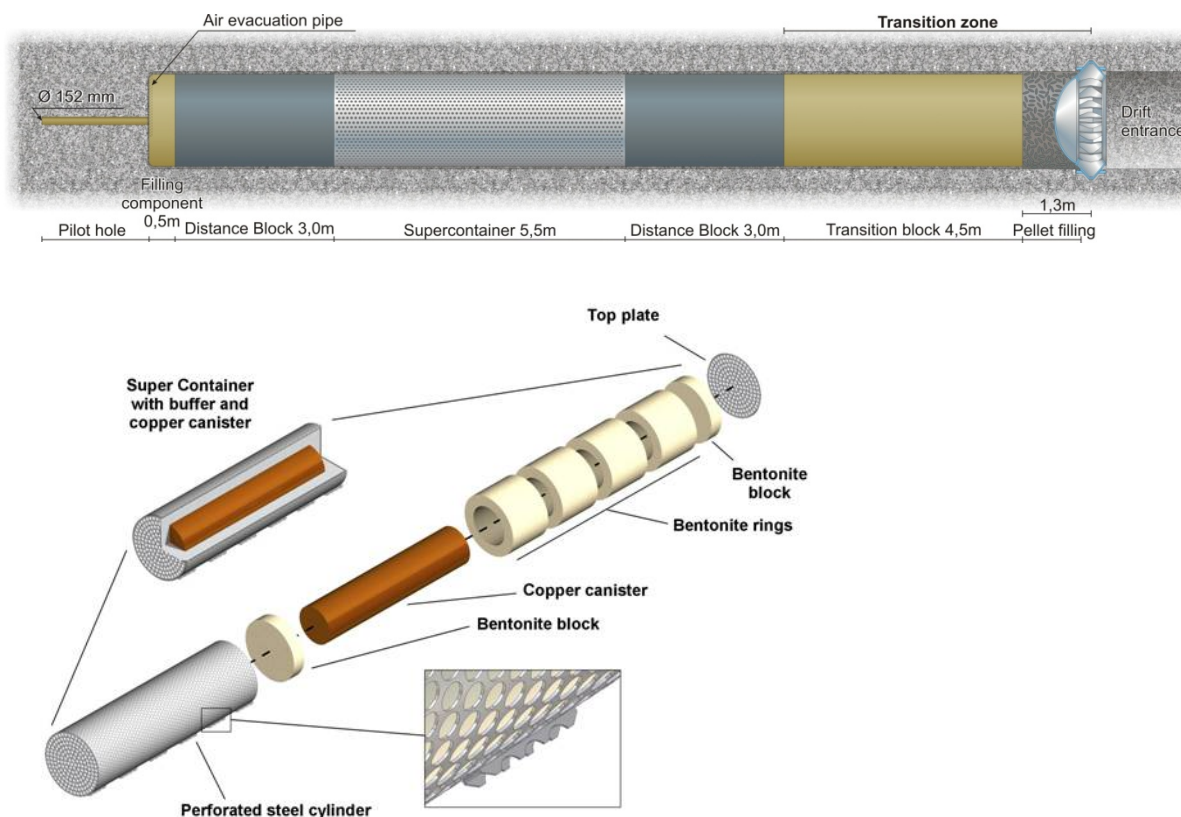


Figure 1. a) Schematic illustration of the MPT layout, b) Schematic Supercontainer design.

The test will be carried out in the 95 m long / 1.85 m diameter drift at the -220 m level of the Äspö HRL.

The two principal objectives of the MPT are:

1. Test the system components in full scale and in combination with each other to obtain an initial verification of design implementation and component function
2. The ability to manufacture full scale components, carry out installation (according to DAWE) and monitor the initial system state of the MPT and its subsequent evolution

The overarching work and instrumentation plans have been reviewed and updated and are expected to be approved end February/beginning March 2012. A first work package meeting was held in November 2011.

The installation of the MPT will be done during autumn 2012.

Instrumentation and preparation

Activities in 2011

The current inflow indicates stable inflow conditions from the onset of the measurements in September until present. Measurements will be discontinued at the end of March.

Tenders for manufacturing of the plug have been received and are being evaluated.

Plans for year 2012

Laser scanning measurements have been postponed till April due to the deposition machine being in the drift and the ongoing inflow measurements. Production of drawings of the measurement system will commence once the instrumentation plan is approved and the number of sensors and contractor have been decided. This is followed by purchasing of measurement system, sensors, data loggers, computers etc.

Buffer and Filling components

Activities in 2011

The buffer mould has been ordered and is under production and is expected to be delivered in time, end of April 2012. Bentonite (MX-80) has been ordered and delivery is soon due.

Plans for year 2012

Following delivery of the bentonite, an acceptance control will be done followed by a compaction test to establish the correct process parameters for the specific material. Subsequently, the bentonite will be mixed with water to attain the required moisture content, prior to pressing of the blocks. A few test blocks will be cut and samples extracted to check the quality of the blocks. The blocks will be sent off for machining and then delivered to Äspö HRL for installation in the MPT.

Machine development work

Activities in 2011

The flaws in the software structure have been surveyed by test driving of the machine with event logging. Bus loads, sensor interfaces and control interfaces have been examined. Based on the findings, software corrections are now programmed off line while a mechanical update of the machine is being conducted. The mechanical update has revealed some unanticipated problems of wear in the sliding plate. The plate has been deformed when sliding the heavy Supercontainer back and forth. The deformation causes tensions in the sliding plate which are lifting the far end of the plate. This is apparently the reason for the jamming problems noted when driving the palette in underneath the Supercontainer. Corrective measures are being planned. When the sliding plate has been repaired new cushions and new sensor systems will be mounted in the palette.

Plans for year 2012

As soon as the mechanical update is ready the control system testing will continue, first by testing structural corrections and then by developing new control methods. When a sufficiently stable control has been

achieved the machine performance will be evaluated in repetitive tests, first with a Supercontainer mock-up and subsequently with distance blocks made of bentonite.

Assembly and transport of the distance blocks down to the test site, as well as transport of the Supercontainer mock-up to ground surface will provide necessary knowledge of the overall transportation process involved in the deposition process. The ultimate goal is to have a sufficiently reliable deposition machine to allow long term testing and analysis of the horizontal deposition concept as a whole.

LUCOEX project WP5 Newsletter 1/2011

The Finnish Posiva Oy is responsible for Work Package 5, KBS-3V Emplacement tests in ONKALO (EMP). This experiment aims at confirmation of the suitability of repository concept by developing and demonstrating emplacement of full scale bentonite buffer components in deposition holes, developing quality assurance methods for this and developing problem handling procedures during installation.

Activities in 2011

In order to acquire complementary expertise and resources for the development and demonstration of the bentonite buffer emplacement concept, Posiva organized a competitive tendering process in January 2011. Altogether 6 expressions of interests were received, leading to 3 tenders. After comparisons and negotiations, the Finnish Insinööritoimisto Comatec Oy was selected. Insinööritoimisto Comatec will support Posiva in developing the bentonite block emplacement and gap filling methods, the needed quality control methods and problem handling instruments.

The buffer emplacement machinery concept development was realized from May to August 2011 in collaboration between Posiva and Insinööritoimisto Comatec. In the process, the main technologies were selected first, alternative choices developed based on them and finally the technologies to be developed further selected. The handling of buffer blocks and pellets will be based on the use of metal container that has suction grippers for the blocks and storage for the pre-measured pellets. With regard to the buffer transfer and emplacement vehicles, 5 different concepts have been examined. After the examinations and feasibility studies, the alternative of creating two vehicle concepts, installation and transfer vehicles, was considered to be most potential for further development.

Plans for year 2012

LUCOEX WP5 main activities in 2012 will be manufacturing of equipment; preliminary buffer emplacement testing and creation of plans for solving emplacement problem situations.