



DOPAS Newsletter 2

DOPAS facts

Full-scale Demonstration Of Plugs And Seals

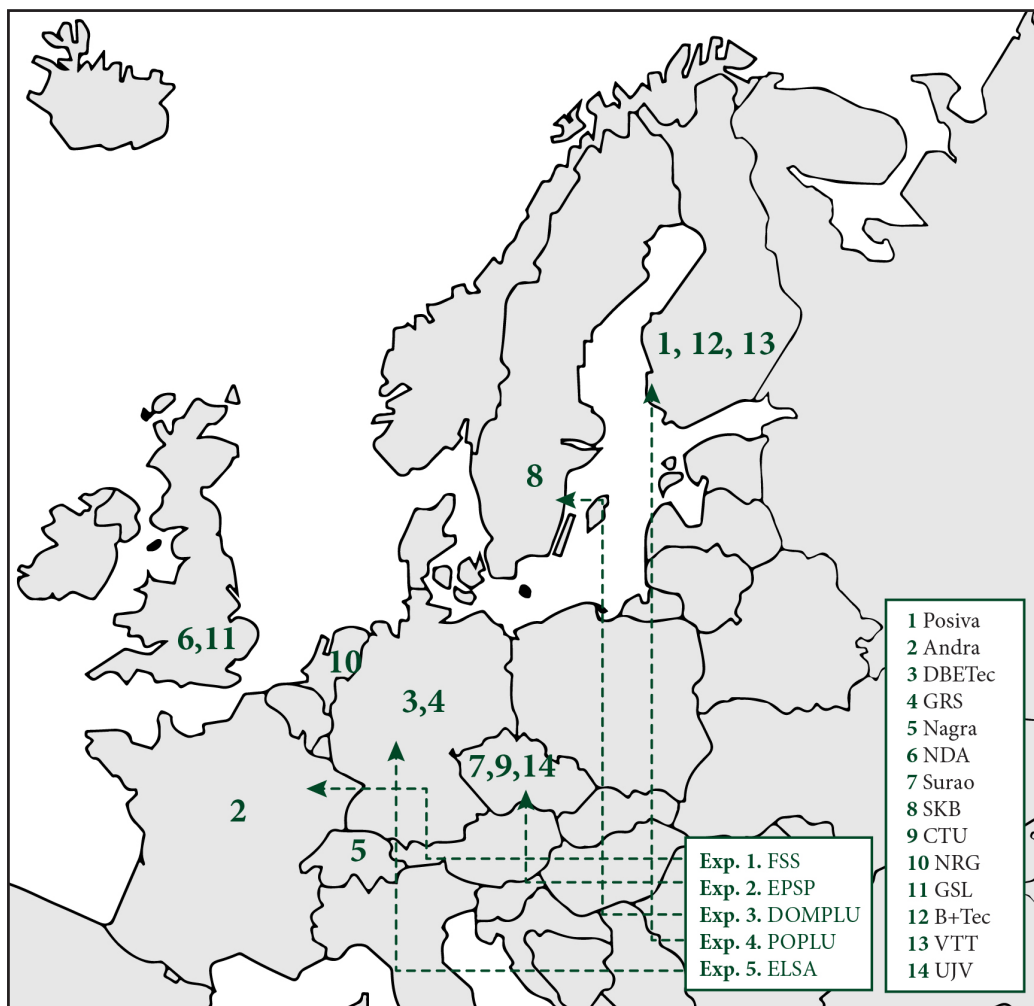
- Project start: 1.9.2012, length is 4 years (48 months), Project end: 31.8.2016
- 5 Full-scale experiments wholly or partially implemented within DOPAS
- Under IGD-TP Key Topic "Technical feasibility and long-term performance of repository components"

More about IGD-TP <http://www.igdtp.eu/>

Future events by DOPAS

- A training workshop planned in 2015
- A joint seminar with IGD-TP planned in 2016

Organisations participating in DOPAS and location of Experiment



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Full scale plug and seal experiments at DOPAS

Status of Experiment 1. FSS

Full scale seal experiment is a technological demonstration to be performed in full scale above surface by Andra and Nagra

Andra and its main sub-contractor have finalized the following work, during the last 1.5 year:

- The design of the drift model (test box) in which the seal construction takes place.
- The design of the seal is confirmed and justified in Deliverable D2.1 (Design Basis), produced within WP2 and published on DOPAS home page.
- The development of the bentonite material used for the construction of the swelling core (admixture of pellets and powder) and the low pH concrete and shotcrete recipes (to be used for the construction of the containment walls) are done.
- The drift model (test box) was constructed and commissioned as “ready for experiment”. This is documented in Deliverable D3.10 (FSS Drift Model construction report) published on DOPAS home page.
- The characterization of the low pH self-compacting concrete is ready and the upstream low pH SCC containment wall was successfully cast in July 2013 (and late



Casting of low pH concrete plug for the containment wall
© Andra

August for bonding operations). This will be documented in Deliverable D3.11 (Report on FSS cast concrete plug construction.)

- The characterization of the bentonitic material (pellets and powder admixture) to be emplaced in the swelling clay core and the characterization of the low pH shotcrete (used for the construction of the downstream containment wall) are ongoing.



FSS test: Bentonite materials emplacement machine to be used for the construction of the swelling clay core.
© Andra



Status of Experiment 2 EPSP

The Czech Experimental Pressure Plug and Seal (EPSP) will be constructed at the Josef Underground Laboratory in granitic rock by a consortium of three institutions - SURAO, CTU the Faculty of Civil Engineering and ÚJV Řež.

Following work has been done for EPSP Experiment:

- The general design of EPSP has been developed according to the requirements (design basis) developed within the DOPAS and described in Deliverable D2.1 (Design Basis), produced within WP2 and published on DOPAS home page.
- Within frame of the laboratory works a plan was produced and published as DOPAS Deliverable 3.16 (Testing plan for the EPSP laboratory experiment). Thereafter several series of initial tests on the bentonite, concrete mixture, rock samples and grouting substances were performed and reported in D3.17 (Interim results of EPSP laboratory testing). Both reports are published on DOPAS homepage

- The following schedule is planned for EPSP implementation:
- Selection of test location: ready 2012
- Preparing the test site – clean up, engineering networks installation (electricity, technological water, data network, lighting, ventilation): ready 4/2013
- EPSP construction – phase 1 – drift shape adjustment, instrumentation boreholes incl. sensors, drilling connecting boreholes incl. casing/tubing, rock grouting: ongoing
- EPSP construction – phase 2 – plug erection, monitoring and technology installation: planned in Summer 2014,
- Pilot testing: planned in Autumn 2014
- Monitoring and testing of plug: Planned in 2014 - 2015



EPSP plug location before rock improvement phase. © CTU



Status of Experiment 3 DOMPLU

The Dome Plug Experiment or DOMPLU is a full-scale deposition tunnel end plug demonstration at Äspö Hard Rock Laboratory (-450 m) lead by SKB in cooperation with Posiva. DOMPLU has been emplaced in Spring 2013 and the experimental set-up includes 45 installed sensors in the backfill, seal and filter layers and another 56 sensors in the outermost concrete dome. Cables from the inner parts of the experiment are led out through two sealed boreholes to a neighbouring tunnel 21 meters away. In a third borehole, water pipes from the specially adapted pump system are led in to the backfill and filter to enable artificial pressurizing of DOMPLU. Sensors within the plug concrete are led out the front face of the concrete dome. The properties being measured by the array of sensors include temperature, relative humidity, strains, displacements, pore pressure and total pressure. Just outside the concrete dome a watertight weir collects water for precise leakage measurements. After several months of pressurization by the groundwater and natural wetting of the bentonite seal, the artificial pressurizing could start in December 2013. The pressure is currently kept constant at 4 MPa and monitoring of



DOMPLU plug with sealed atmosphere. © SKB

the plug performances is ongoing. The original target of pressurization at 7 MPa will be abandoned due to fact that water began escaping from the test area at 3,4 MPa, bypassing DOMPLU via weaknesses in the rock. Instead, the test will be continued at a constant pressure of 4 MPa as this corresponds to the maximum expected groundwater pressure in the Spent Fuel Repository. The DOMPLU experiment is within schedule.

Status of Experiment 4 POPLU

POPLU deposition tunnel end plug experiment will be implemented in ONKALO demonstration area at the planned disposal depth within POPLU project led by Posiva in cooperation with SKB, VTT and B+Tech.

- The structural design of the POPLU plug has been completed, including revisions of dimensions, reinforcement, grouting and seals. The design of the plug has been modelled using FEM for THM evolution due to the accelerated performance test and expected lifetime. The modelling work has also contributed to the test and instrument planning of POPLU, which was subjected to the Expert Elicitation process as an independent review.
- Two dedicated demonstration tunnels have been excavated at the ONKALO site, at -420 metres in autumn 2013. The tunnel lengths are approximately 25 metres each and these were excavated using careful drill and blast methods to minimize the EDZ and potential hydraulic conductive features. Modified methods of rock support and materials have been developed to preserve the plug



POPLU Drilling of monitoring boreholes. © Posiva

location and aid in water tightness. The location for POPLU Experiment in demonstration tunnel 4 was selected based in the rock suitability classification (RSC) method developed by Posiva and the results were reported in Deliverable D3.26



Status of Experiment 5 ELSA

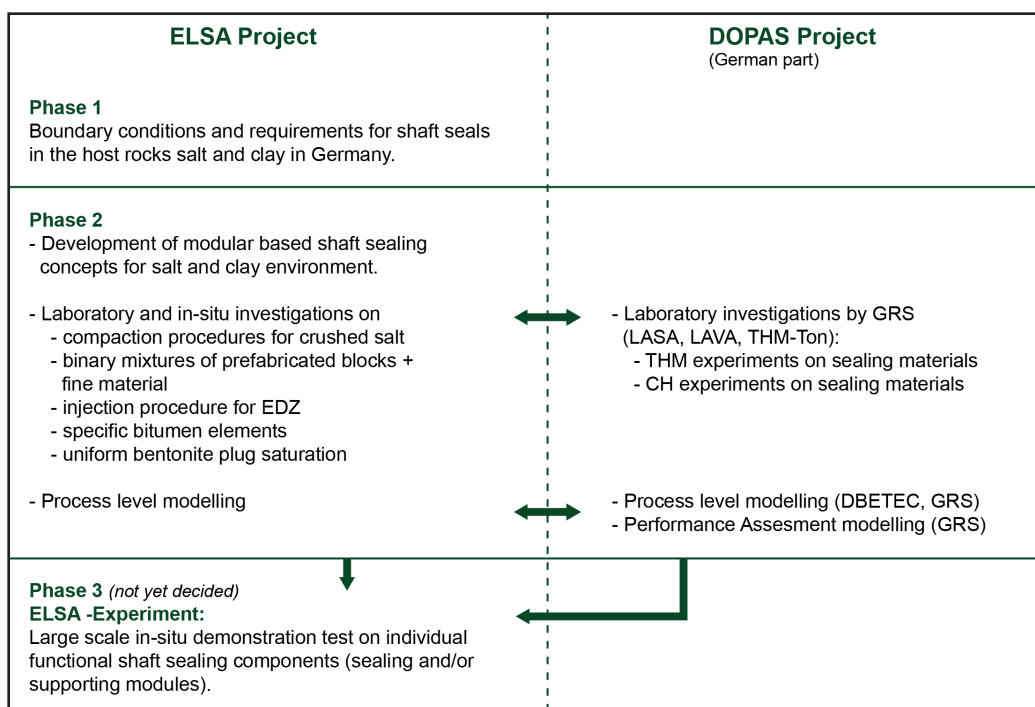
• ELSA is a programme of laboratory and in-situ experiments that will be used to further develop the reference shaft seal for the German disposal concept for a repository in rock salt and to develop reference shaft seals for a repository in clay host rocks. The Project is divided into three phases:

- Phase 1: Boundary conditions and requirements for shaft seals in salt and clay host rocks
- Phase 2: Development of shaft sealing concepts and testing of functional elements of shaft seals in laboratory tests and in small-scale in-situ tests, including testing and calibration of mathematical models of material behaviour.
- Phase 3: A large-scale demonstration test of specific sealing components and adjustment of the sealing concept. The main requirements of the test are to demonstrate technical feasibility and long-term effectiveness.
- The generic design concepts for shaft seals in salt and clay host rocks are developed in accordance with the requirements for a repository for HLW (BMU, 2010).

Currently, the design basis for the ELSA experiment is based on:

- the current shaft seal design developed during the VSG project (“VSG = preliminary safety analysis of the Gorleben site”) (Müller-Hoeppe et al., 2012)
- a research project performed by the Technical University of Freiberg where specific shaft sealing elements have been developed, materials have been selected, and a practical solution for implementation has been developed (Kudla et al., 2009),
- and the results of the first phase of the ELSA project where requirements for shaft seals have been documented and an example of how to demonstrate the integrity of specific seal components is given (Kudla et al., 2013, Jobmann, 2013, Herold & Müller-Hoeppe, 2013)
- The actual experimental design planned for ELSA-Phase-III will have to be adapted to the geology and the geometric characteristics of the actual testing site, which has not yet been selected. Currently, it is not intended to seal a complete shaft but to only test prototypes of the different sealing elements on a large scale. The cited literature is available on the DOPAS website.

Experiment 5 ELSA relation to the DOPAS



News

WP3 progress

A short video by ANDRA and GMES informs the status of FSS experiment and preparation work done during 2013.
http://www.posiva.fi/dopas/wp_3/experiment_1_fss/fss_progress

WP6 progress

Pilot Elicitation for POPLU monitoring plan carried out in 2013

Piloting the Expert Elicitation (EE) process for the POPLU test's instrumentation planning was carried out during May 2013-September 2013. The feedback from the process was favourable for the continuation of the work regarding the future final deliverables of the Work Packages 2 to 5. The consensus meeting results were reported in a memorandum for the whole consortium.

Expert Staff Exchange Visits starting in June 2014

DOPAS work includes besides the coming training workshop in 2015 opportunities for learning from each other's experiments also for other consortium personnel besides the project personnel. For such purpose three different staff exchange visits will be organised. The first visit takes place to the FSS experiment in St.Dizier in France during June 2014. Further two visits will take place

in the Czech Republic at the Josef Gallery for the EPSP experiment and for the POPLU test in ONKALO Finland this year. The staff exchange visit calls will be announced by the responsible experiment leaders to the consortium. Further general information about the staff exchange visit is available from the scientific contacts of each project partner.

Expert Elicitation planning for deliverables on going

Following the results from the pilot EE, the consortium has produced a long list of potential experts to be engaged in the Expert Elicitation of the final work package deliverables. A short list of experts will be compiled for approval to the next General Assembly meeting no 3 in November 2014. The elicitations are currently scheduled to start after the summer of 2015.

Dissemination activities

- DOPAS project and EPSP experiment has been presented in Euradwaste 2013 conference in Vilnius October 2013. http://cordis.europa.eu/fp7/euratom-fission/euradwaste-2013_en.html The posters presented in the conference can be seen in DOPAS homepage.
- DOPAS and its experiments was presented in PEBS final conference in Hannover in February 2014 in oral presentation http://www.pebs-eu.de/PEBS/EN/Events/events_inhalt_en.html
- The DOPAS project and the POPLU and DOMPLU Experiments was presented in WMSYM in Phoenix, Arizona, March 2014. www.wmsym.org
- FSS Experiment and casting the SCC wall was presented in NUWCEM 2014 International Conference for cement based materials for Nuclear Waste in June 2014, Avignon <https://www.sfen.fr/NUWCEM-2014>
- POPLU low-pH concrete recipe development presentation will be presented in Concrete Innovation Conference in Oslo June 2014 - www.cic2014.com
- DOPAS and Design basis for plugs and seals and also POPLU monitoring plans will be presented in IGD-TP Geodisposal in Manchester in June 2014 <https://www.meeting.co.uk/confercare/geodisposal2014>

