



## Beacon Newsletter December 2019

The Beacon project started in June 2017 and is now well over half way through the project through to the end the 31 May 2021. Beacon is short for Bentonite mechanical evolution. Bentonite is a clay with swelling properties, and its sealing ability is essential for the engineered clay barriers in all geological repository concepts. The overall objective of the Beacon project is to develop and test the tools, mainly numerical models, necessary for the assessment of the mechanical evolution of an installed bentonite barrier and the resulting sealing ability of the barrier. More info at [www.beacon-h2020.eu](http://www.beacon-h2020.eu). The work is progressing according to plan and integration between the work packages is functioning well.



### Upcoming events

**WP3 and WP5 workshop** in Paris 13-14 Feb 2020, at [SGF Registration](#)

**3<sup>rd</sup> Annual Meeting, 13-14 May, 2020**, Université de Liège, Belgium. [Registration](#)

**WP2 meeting, 12 May, 2020**, Université de Liège, Belgium. [Registration](#)

### Scholarships

Available for students and other interested that would otherwise not be able to participate, to cover reasonable costs for travel and accommodation to attend Beacon Annual meetings. Re-requests containing name, org., short description of background, and, also short motivation for participation to [beacon@skb.se](mailto:beacon@skb.se)

### Progress in the work packages

#### WP1 Definition of assessment case/ Application to the assessment case

In the frame of WP1 the assessment cases for the Beacon project have to be defined. Andra, Nagra and SKB are drafting the basis for the modellers for predicting the degree of homogeneity to be expected for the different nearfield configurations.

#### WP2 Collection and compilation of existing data and available models

The key objectives of Beacon WP2 are to collect relevant information as produced from past and ongoing projects that provide knowledge relevant to understanding bentonite mechanical evolution in a repository context, to process it to a level where it can be useful as input to the other Beacon work packages and to update as Beacon progresses to ensure currency. Existing data and models were collected at the very beginning of the project. WP2 have followed progress and given input to the other WPs. Preparations for the final deliverable has started.

### New contacts

Lasse Lavikainen has left **Posiva** and a new contact will be assigned soon. Until then temporary contacts are Ville Heino [ville.heino@posiva.fi](mailto:ville.heino@posiva.fi) and Petri Koho [petri.koho@posiva.fi](mailto:petri.koho@posiva.fi)

**Clay Technology's** new contact is Ola Kristensson [osk@claytech.se](mailto:osk@claytech.se). Mattias Åkesson is from the 1 Dec working at SKB and has a new address [mattias.akesson@skb.se](mailto:mattias.akesson@skb.se). He will continue to do work in Beacon so just change his address

## WP3 Model development

WP3 are presenting their second deliverable D3.2 describing the most significant improvements of the hydromechanical models carried out by the modelling teams involved in the WP.

The initial formulation of the constitutive models to be used by the different modelling teams was described in Deliverable 3.1. Since then, improvements have been made to the constitutive models themselves as well as to their implementation into computer codes. They are reported in Deliverable 3.2, currently under revision. It will be available [here](#).

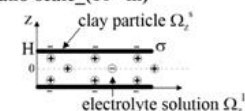
Most of the improvements result from the inner logic of model development.

However, some developments are related to the need to analyse adequately the cases proposed in WP5. For instance, there have been advances by some teams related to the appropriate simulation of friction in some WP5 benchmarks involving laboratory tests.

Overall, the large diversity of approaches and formulations present at the start is being maintained at the current stage of the project.

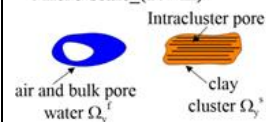
Task 3.3 requires the verification of the basic features of the models against simple benchmarks. To that end, a set of results from a programme of laboratory tests performed at EPFL has been selected as a suitable benchmark. A description of the case has been circulated among the WP3 participants and the initial results will be discussed in the forthcoming WP3-WP5 meeting in Paris.

### Nano-scale ( $10^{-9}$ m)



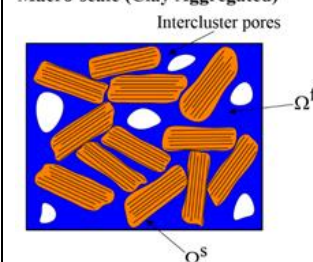
1st Averaging

### Micro-scale ( $10^{-6}$ m)



2nd Averaging

### Macro-scale (Clay Aggregated)



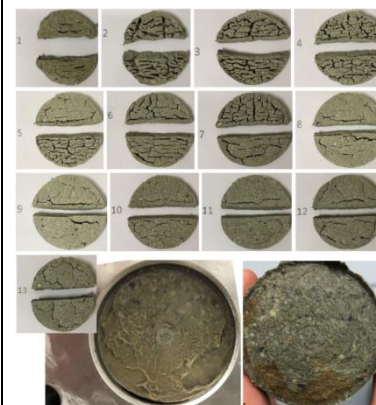
Three-scale representation of the upscaling model (Antonio Gens, UPC).

## WP4

The experiments performed in the frame of Beacon are aimed at obtaining a more complete cognition of bentonite behaviour – by investigating different wetting dynamics or load scenarios, looking at different granulations and inhomogeneous systems or at different bentonite types, and by developing new methods of measurement. The work performed by various organisations has been structured into investigation of

- Hydromechanical behaviour of macroscopically homogeneous bentonite material
- Swelling into limited void
- Binary mixtures or artificial inhomogeneities
- Influence of the degree of saturation on the shearing behaviour at the bentonite – steel interface

All the experiments and results are summarised on the Beacon web [www.beacon-h2020.eu](http://www.beacon-h2020.eu) and documented in detail in the Deliverable D4.1/2 “Bentonite mechanical evolution – experimental work for the support of model development and validation” of the Beacon project, which is also available at the [Beacon site](#). Not all of the investigations are completed yet - future work includes the completion of ongoing experiments, and especially the development of new or improved test methods, like particle tracking, small-scale pressure measurement or X-CT in-situ observation is furthered.



Bentonite samples (BGS). From D4.1





## WP5 Testing, verification and validation of models

Work is ongoing in the **second task** of WP5. The objective of this task is to model existing large scale field tests to show the capacity of the models to reproduce in situ experiments. Based on the work in WP2, a selection of test cases from large scale experiments is considered. The main criteria of choices are:

- The experiments have to be well described and dismantled.
- The experiments have to be relevant to disposal concepts used by project partners
- The experiments should highlight the role of heterogeneities in bentonite component.

Based on these criteria and after discussions during the annual meeting in May 2018, 3 experiments have been selected:

- EB - Engineered Barrier Emplacement Experiment (EB experiment), dismantled after almost eleven years of operation, was carried out in a gallery excavated in the Opalinus clay of the Mont Terri Rock Laboratory. The EB experiment was coordinated by ENRESA
- FEBEX - Full-scale Engineered Barrier Experiment in Crystalline Host Rock, is a research and demonstration project that was initiated by ENRESA (Spain).
- CRT - Canister Retrieval Test (CRT) is a project that was initiated by SKB at Äspö Hard Rock Laboratory.

All the results are summarised on the Beacon web [www.beacon-h2020.eu](http://www.beacon-h2020.eu) and documented in detail in the Deliverables *D5.1.2 Synthesis of results from task 5.1* and *D5.2.1 Testing, verification and validation of models Step 2* of the Beacon project, which is also available at the [Beacon site](http://www.beacon-h2020.eu).

Work in the **third task** is being prepared.

## WP6 Dissemination to civil society

There have been some discrepancies related to the content and deliverables in WP6 that are hopefully soon to be behind us. The WP6 civil society representatives plunged into the difficult task of getting grips of the scope, work and deliverables of Beacon. Updated versions of deliverables D6.1 and D6.2 will soon be submitted and available on [www.beacon-h2020.eu](http://www.beacon-h2020.eu)

## Latest events

### Second Annual meeting in Prague

60 people from 33 organisations in 11 countries all over Europe interested in Beacon results met for the 2<sup>nd</sup> Annual Meeting 21-22 May, 2019. Hosts were Universita Karlova (CUNI) and SURAO, and the meeting was held in the Faculty of Science. Modelling and experimental results were presented and discussed for two full intensive days. The 23 May there was an optional visit to URF Bukov. Special thanks to Nicol Novotna and David Mašín.

### WP3 and WP5 workshop in Paris in January 2019

29-30 January 30 Beacon participants, met in a snowy Paris to discuss and take work in the modelling work packages a step further. Jean Talandier and Andra arranged the meeting.

The next WP3/5 meeting is again in Paris, 13-14 February, 2020. This time the meeting is located to [SGF](http://www.sgf.fr). The address is:  
77 rue Claude Bernard, Maison de la Géologie, Paris



## Beacon 1st Annual Meeting and workshop on Milos

Many of the people working in the Beacon project on Bentonite mechanical evolution had never seen bentonite in its natural environment. So the first Annual meeting of Beacon was held on the island Milos in Greece 29-30 May 2018 and a visit to the bentonite mine on the island was arranged. 49 participants were able to defy the winds and make it to the meeting.



*The bentonite mine in Milos*



*The Beacon project consortium at the 1<sup>st</sup> Annual meeting of Beacon, on Milos, May 2018.*