FORGE
Fate Of Repository Gases
European Commission FP7

Performance Indicators for Monitoring Progress within the FORGE Project

FORGE Report: D0.2 – Ver.0

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Fate of repository gases (FORGE)

The multiple barrier concept is the cornerstone of all proposed schemes for underground disposal of radioactive wastes. The concept invokes a series of barriers, both engineered and natural, between the waste and the surface. Achieving this concept is the primary objective of all disposal programmes, from site appraisal and characterisation to repository design and construction. However, the performance of the repository as a whole (waste, buffer, engineering disturbed zone, host rock), and in particular its gas transport properties, are still poorly understood. Issues still to be adequately examined that relate to understanding basic processes include: dilational versus visco-capillary flow mechanisms; long-term integrity of seals, in particular gas flow along contacts; role of the EDZ as a conduit for preferential flow; laboratory to field up-scaling. Understanding gas generation and migration is thus vital in the quantitative assessment of repositories and is the focus of the research in this integrated, multi-disciplinary project. The FORGE project is a pan-European project with links to international radioactive waste management organisations, regulators and academia, specifically designed to tackle the key research issues associated with the generation and movement of repository gasses. Of particular importance are the long-term performance of bentonite buffers, plastic clays, indurated mudrocks and crystalline formations. Further experimental data are required to reduce uncertainty relating to the quantitative treatment of gas in performance assessment. FORGE will address these issues through a series of laboratory and field-scale experiments, including the development of new methods for up-scaling allowing the optimisation of concepts through detailed scenario analysis. The FORGE partners are committed to training and CPD through a broad portfolio of training opportunities and initiatives which form a significant part of the project.

Further details on the FORGE project and its outcomes can be accessed at www.FORGEproject.org.

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Foreword

This report defines the strategy for monitoring performance within the FP7 FORGE project.

Contents

1 Introduction

The multiple barrier concept is the cornerstone of all proposed schemes for underground disposal of radioactive wastes. The concept invokes a series of barriers, both engineered and natural, between the waste and the surface. Achieving this concept is the primary objective of all disposal programmes, from site appraisal and characterisation to repository design and construction. However, the performance of the repository as a whole (waste, buffer, engineering disturbed zone, host rock), and in particular its gas transport properties, are still poorly understood. Issues still to be adequately examined that relate to understanding basic processes include: dilational versus visco-capillary flow mechanisms; long-term integrity of seals, in particular gas flow along contacts; role of the EDZ as a conduit for preferential flow; laboratory to field up-scaling. Understanding gas generation and migration is thus vital in the quantitative assessment of repositories and is the focus of the research in this proposal for an integrated, multi-disciplinary project. The FORGE proposal is for a pan-European project with links to international radioactive waste management organisations, regulators and academia, specifically designed to tackle the key research issues associated with the generation and movement of repository gasses. Of particular importance are the long-term performance of bentonite buffers, plastic clays, indurated mudrocks and crystalline formations. Further experimental data are required to reduce uncertainty relating to the quantitative treatment of gas in performance assessment. FORGE will address these issues through a series of laboratory and field-scale experiments, including the development of new methods for up-scaling allowing the optimisation of concepts through detailed scenario analysis. The FORGE partners are committed to training and CPD through a broad portfolio of training opportunities and initiatives which form a significant part of the project.

FORGE proposal is a pan-European project, with links to international radioactive waste management organisations, regulators and academia specifically designed to tackle the key research issues associated with the generation and movement of repository gases in radioactive waste disposal facilities. The work packages are:

- WP 1 Treatment of gas in performance assessment;
- WP 2 Gas generation;
- WP 3 Engineered barrier systems;
- WP 4 Disturbed host rock formations;
- WP 5 Undisturbed host rock formations.

This document is to record how performance within the FORGE project will be monitored and reported.

2 Performance Indicators

Performance indicators are an important element of project monitoring used by the co-ordination team to facilitate management of the project to ensure that project objectives are achieved within the programme and to focus corrective actions if these are required. Within FORGE there are several categories of performance indicators:

- Technical indicators;
- Dissemination/outreach indicators;

- Training indicators;
- Schedule indicators.

2.1 TECHNICAL INDICATORS

Essentially these measure the scientific outputs of the project and will include:

- Reports;
- Peer reviewed publications;
- Presentations at/contributions to scientific meetings including FORGE project workshops.

2.2 DISSEMINATION/OUTREACH INDICATORS

These will be a measure of how widely knowledge arising in FORGE is disseminated within the project and to the wider stakeholder community. They include:

- Statistical summaries of web site access (including number of visits, visit duration, report downloads etc);
- Record of 'external' attendees at FORGE workshops;
- Record of distribution of information materials about FORGE
- Involvement of non-EC members of the Steering Committee and their participation in technical meetings and workshops etc.

2.3 TRAINING INDICATORS

Training is an important element of FORGE and the project will be promoting mobility of students working in the project between research institutions. Measures include:

- Number of PhD studentships fully or partly supported by FORGE;
- Number of other graduate students involved in te FORGE project;
- Number/duration of 'mobility grants, in FORGE;

Training opportunities made available to people outside FORGE.

2.4 SCHEDULE INDICATORS

Quarterly progress reporting by all partners will record reasons for any delays and actions taken to correct them.

FORGE is a large, integrated project and one of the key measures of success of the project will be how well the different parts of the project are integrated. One of the indicators for this will be the range of participants and the breadth of the topics covered at the FORGE workshops.

2.5 STEERING COMMITTEE

The Steering Committee, comprising the Work Package Leaders, representatives of some of the other partners and external members will meet at least annually. These meetings will be supplemented by meetings of the internal members of the Committee and Work Package Leader meetings. A key activity at all of these meetings will be a review of progress in all WPs and particular attention will be given to identifying and mitigating all identified actual and potential problems in the project.

2.6 PROGRESS BEYOND STATE-OF-THE-ART

A good overview of the state of the art was provided in the GASNET (2003) report and an early deliverable within FORGE will be a report on the current state of the art in relation to Performance Assessment since the GASNET report was published. How far beyond this state-of-the-art FORGE extends the understanding, knowledge and prediction of gas generation and migration in a radioactive waste repository context will be a key success criteria.

The understanding and prediction of the evolution of repository systems over geological timeframes requires a detailed knowledge of a series of highly-complex coupled phenomenological processes. There remains significant uncertainty regarding the mechanisms and processes governing gas generation and migration in natural and engineered barrier systems. It is thus important to understand a system to an adequate level of detail to allow confidence in the assessment of site performance, recognising that a robust treatment of uncertainty is desirable. Of particular importance to the European radioactive waste management programmes are the long-term engineering performance of bentonite buffers, plastic clays, indurated mudrocks and crystalline formations. To reduce uncertainty, further experimental data are required to address:

- Corrosion and gas generation rates in repository environments;
- Key issues relating to the migration and fate of repository gases;
- Validation of numerical codes;
- Derivation of new methodologies for up-scaling from laboratory to field to repository scales;
- Optimisation of repository concepts through detailed scenario analysis.

These aspects will be examined in detail by the experimental Work Packages which will provide information for use in WP 1 which is directly relevant to repository performance assessment. This will extend levels of understanding well beyond the current state-of-the-art.

WP 2 will examine the rate of hydrogen production to provide information in support of repository performance assessment. The key processes to be better understood are the impact of radiation on near field materials and the role of chemical processes, in particular the corrosion of metals. Experiments will measure hydrogen production rates from the corrosion of steel in contact with bentonite under different test conditions, improving our understanding of these issues.

WP 3 will examine unresolved issues related to gas migration which can detrimentally alter the hydraulic and mechanical (and potentially the thermal and chemical) properties of the engineered barrier systems. A detailed series of laboratory and field scale experiments will be undertaken to provide new fundamental insights into the processes and consequences of gas migration through the engineered barrier and seals of repositories.

While progress has been made in recent years in our understanding of the EDZ through projects like SELFRAC and NF-PRO, there remains a paucity of representative data for both the definition of hydro-mechanical responses to complex stress paths induced during repository construction, and to the role of gas migration on issues including fracture self-sealing, tunnel convergence, radionuclide displacement and repository over-pressuring. These complex issues will be addressed through a state-of-the-art laboratory and field-based test programme aimed at the provision of process-based knowledge and the production of a unique representative dataset with which to develop and validate theoretical frameworks and predictive numerical tools for different lithological units aimed at repository performance assessment. Experimental and numerical developments, made within WP 4, will significantly improve our ability to describe (in physical and numerical terms) the behaviour and evolution of the repository EDZ post-closure. In particular, this will improve understanding of its capacity to act as a potential focus for the development of preferential flow paths leading to the early release of radionuclides to the biosphere.

In order to better evaluate the conditions under which gas can migrate to the biosphere, it is essential to understand the processes and mechanisms governing gas migration in the far field. WP 5 will address these issues through a detailed programme of laboratory and field-scale experiments. These will provide important new data for the validation of numerical models for use in repository performance assessment.

The important experimental work performed in WP 2, 3, 4 and 5 will be used to greatly enhance numerical modelling capability of gas migration in repository situations and will lead to real progress in the development of new conceptual models. An important aspect of this work will be the validation of computational tools through the comparison of experimental results with numerical simulations and the critical examination of different modelling approaches through a series of numerical benching exercises. The output from FORGE will provide the scientific community with a significant number of reference cases for future application in repository design and engineering.

Modelling the highly coupled and complex scientific issues related to gas migration in repository environments remains a challenge for the research groups evaluating the impact of gas on an underground radioactive waste repository. At present, this cannot be included in a robust and rigorous way in current PA activities. However, numerical tools, underpinned by quantitative experimental observations and high-resolution datasets, are required to demonstrate:

- a detailed understanding of the physical and temporal processes associated with gas migration in a storage facility for radioactive waste;
- an ability to predict the key processes and parameters such as the evolution of gas pressure, water saturation and fluid flux both spatially and temporally within all components of the repository system in a clear and demonstrable manner;
- appropriate levels of confidence in both experimental results and numerical predictions;
- up-scaling in a quantitative manner through the computation of large scale models which incorporate gas migration processes at an appropriate level of detail, from the generation terms located in the waste form to the sink terms located in the EDZ, access shafts or the repository far field.

FORGE will address these issues through the provision of new experimental data, enhanced process understanding and the validation of theoretical frameworks for the movement of gas in repository environments.

3 Scientific and technological methodology and work plan

3.1 OVERALL STRATEGY AND GENERAL DESCRIPTION

The five inter-related work packages and a detailed co-ordination plan have been designed in close collaboration with the Waste Management Organisations (WMO), regulators and academia in order to address the key scientific issues relating to gas migration and its treatment in repository PA.

3.2 MODELLING CO-ORDINATION

To ensure full integration of laboratory and field-scale experiments with the modelling activities undertaken within the project, provision has been made for the role of Modelling Co-ordinator (Andra) within WP1. Numerical simulations are an essential component in the quantitative treatment of gas in repository PA and are integral to each work package. Models provide a robust way of evaluating key factors and coupled processes during the evolution of the EBS, near field, far field and transit times to the biosphere. Factors to be modelled include:

- The evolution of gas pressure in the EBS and the risk of associated mechanical damage;
- The evolution of water saturation;
- Gas driven radionuclide movement;
- Displacement of contaminated interstitial fluid.

The role of Modelling Co-ordinator will be specifically to overview all aspects of this work thus ensuring appropriate focus, facilitating the cross-flow of ideas and concepts between WP's. This will also ensure best practice is shared between all participants and teams.

3.3 VALIDATION OF CODES AND APPLICATION TO EXPERIMENTS

The proposed experimental work in FORGE will improve process understanding and scientific knowledge regarding gas generation and migration processes in future radioactive waste repositories. The experiments performed on candidate host rocks (undisturbed and disturbed) and the artificial materials used for seals and the engineered barrier will be an essential element in the validation of the numerical tools. This will complement the modelling work undertaken in each of the work packages. It is important to note, that the output from FORGE will be amenable to future numerical code development which is beyond the scope of this proposal.

3.4 MEASURES

Several factors will be used within FORGE to formally record outcomes of the project as work progresses. These include:

- Reports – a comprehensive suite of formal and project reports has been planned to provide a record of the project (listed in Appendix 1). These include formal deliverables to the Commission (identified in **bold** in Appendix 1) as well as a number of interim reports intended to document current status and report emerging data.
- Experimental data and updated modelling codes – as the project matures new understanding and validated experimental results will become available to support modelling of gas in a repository setting. There will also be revisions to modelling codes that will allow better representation of gas in numerical models.
- Themed workshops and final conference – in the latter half of the project the co-ordination team will organise three one-day themed workshops to disseminate outcomes. Workshop topics are likely to be:
    - Mechanisms and processes governing gas migration in the near field (EBS and EDZ) and its impact on repository performance;

- Mechanisms and processes governing gas migration in undisturbed rock formations (with application to both repository systems and CCS);
- The treatment of gas in repository design and performance assessment.

The final international conference will be aimed at both the dissemination of FORGE outcomes to the radioactive waste stakeholder community and to scientists and policy makers from other relevant industrial sectors, including CCS, gas storage, hydrocarbon management and exploitation and toxic waste disposal.

- Training is an important element of FORGE and a key measure of the success of the project and one of its lasting legacies will be the development of scientists who are better equipped to meet the challenges of leading future phases of radioactive waste disposal programmes.

3.5 PROGRESS REPORTING

As the primary means of monitoring progress within FORGE, apart from completion of deliverables and other milestones, a formalised progress reporting schedule has been established. All partners will report on the current status of all their activities against the project objectives and, where necessary, identify remedial action that will be taken to mitigate any potential problems. The following progress reporting schedule has been implemented:

- Quarterly each partner will provide a brief report to co-ordination team, copied to relevant WP leaders, every 3 months (due 31st March, 30th June, 30th September and 31st December each year)
- Every 9 months each WP leader will provide a short compiled progress report on progress on their Work Package based on the above reports (due 15th October 2009, 15th July 2010, 15th April 2011, 15th January 2012 and 15th October 2012)
- The Co-ordinator will compile a progress report for the whole project in July 2010 and January 2012 based on the above reports and a final report at the end of the Project.

All of the above reports will summarise progress to date and provide commentary on all deliverables, milestones etc due in the report period with particular comment on any that are delayed with details on actions taken to expedite completion.

Release of further funding will be contingent upon both successful completion of all scheduled project reporting requirements and delivery of all project deliverables.

Appendix 1 Full Deliverables List for FORGE

Table 1.2 below provides a summary of the deliverables from the FORGE project. Key deliverables requiring formal Commission approval are highlighted in bold and indicated with a suffix of R after the deliverable number. Other reports listed below will be made available to all consortium members via the FORGE internal website and where appropriate also be made more widely available.

Del. no. [1]	Deliverable name	WP no.	Nature[2]	Dissemination level [3]	Delivery date (Months from start)[4]
D0.1	Internal project website created	WP 0	O	PP	2
D0.2-R	**Performance indicators for progress monitoring**	**WP 0**	**O**	**PP**	**2**
D0.3	Creation of public project website	WP 0	O	PU	3
D0.4	Project presentation	WP 0	O	PU	3
D0.5-R	**PUDKA**	**WP 0**	**R**	**PU**	**6**
D1.1	Draft report on definition of benchmark studies on repository-scale numerical simulations of gas migration	WP 1	R	PP	6
D5.1	Detailed description of experimental set-up and procedure for gas-driven radionuclide transport	WP 5	R	PP	6
D1.2-R	**Summary of gas generation and migration current state-of-the-art**	**WP 1**	**R**	**PU**	**6**
D3.1-R	**State of the art report on gas transport through interfaces**	**WP 3**	**R**	**PU**	**10**
D1.3	Progress report on benchmark studies on repository-scale numerical simulations of gas migration	WP 1	R	PP	12
D2.1	State of the art, experiment specifications and validation of experimental devices	WP 2	R	PU	12
D3.2	Description of proposed *in situ* experimental set-ups (within URL)	WP 3	R	PP	12
D3.3	Description of proposed laboratory experimental set-ups and procedures (bentonite, interface and concrete)	WP 3	R	PP	12

1 Deliverable numbers in order of delivery dates. Please use the numbering convention <WP number>.<number of deliverable within that WP>. For example, deliverable 4.2 would be the second deliverable from work package 4.

2 Please indicate the nature of the deliverable using one of the following codes:
R = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

3 Please indicate the dissemination level using one of the following codes:
PU = Public
PP = Restricted to other programme participants (including the Commission Services).
RE = Restricted to a group specified by the consortium (including the Commission Services).
CO = Confidential, only for members of the consortium (including the Commission Services).

4 Measured in months from the project start date (T_0 = month 1).

D3.3	Description of proposed laboratory experimental set-ups and procedures (bentonite, interface and concrete)	WP 3	R	PP	12
D3.4	Description of proposed initial numerical codes and conceptual model	WP 3	R	PP	12
D3.5	Progress report	WP 3	R	PU	12
D4.1	Description of laboratory experimental set-ups (argillaceous and crystalline formations)	WP 4	R	PP	12
D4.2	Description of proposed *in situ* experimental set-ups (within URLs)	WP 4	R	PP	12
D4.3	Report – compilation of existing data (Mont Terri)	WP 4	R	PP	12
D4.4	Progress report – design of Boom Clay *in situ* test	WP 4	R	PP	12
D4.5	Description of initial numerical codes and conceptual model	WP 4	R	PP	12
D4.6	Progress report – review of Opalinus and Boom Clay parameters	WP 4	R	PU	12
D4.7	Progress report – simulation of initial designs	WP 4	R	PP	12
D5.2	Design, installation and compilation of existing data for the HG-C experiment at Mont Terri	WP 5	R	PP	12
D5.3	Description of laboratory gas transport experimental set-ups and procedures	WP 5	R	PP	12
D5.4	Design and installation of the PGZ1 experiment at Bure	WP 5	R	PP	12
D5.5	Description of initial numerical codes and conceptual model (undisturbed host rocks)	WP 5	R	PP	12
D3.6	Results of the tests on concrete (part 1)	WP 3	R	PP	13
D4.8	Report – HM modelling of HG-A micro tunnel	WP 4	R	PU	14
D2.2	Preliminary results of hydrogen evolution rate and transport properties in compacted bentonite	WP 2	R	PU	18
D3.7	Experimental results with aluminium-plexiglass tubes (bentonite/argillite interface)	WP 3	R	PP	18

D4.9	Progress report – field installation and rock characterisation	WP 4	R	PP	18
D3.8	Final report on LML experimental results	WP 3	R	PP	24
D1.4-R	Preliminary report on benchmark studies on repository-scale numerical simulations of gas migration	WP 1	R	PP	24
D2.3-R	Preliminary interpretation of experimental and modelling results	WP 2	R	PU	24
D3.9	Interim report on interface laboratory test state	WP 3	R	PP	24
D3.10	2nd progress report	WP 3	R	PP	24
D3.11	Report on conceptual design of the gas cell HLW experiment	WP 3	R	PP	24
D3.12-R	Small scale experimental results and modelling	WP 3	R	PP	24
D3.13	Measurements of gas entry pressure	WP 3	R	PP	24
D3.14	Detailed description on gas migration tests in concrete	WP 3	R	PP	24
D4.10	Progress report on HG-A experimental activities	WP 4	R	PP	24
D4.11	Progress report – field installation and initial tests (Boom Clay)	WP 4	R	PP	24
D4.12	Progress report – definition of constitutive laws and initial simulations	WP 4	R	PP	24
D4.13	Progress report – definition of constitutive laws and initial simulations	WP 4	R	PP	24
D5.6	Progress report on HG-C experiment at Mont Terri	WP 5	R	PP	24
D5.7	Progress report: Experimental geometry and preliminary results (laboratory gas transport experiments)	WP 5	R	PP	24
D5.8	Results and interpretation of gas-driven radionuclide transport in Boom Clay	WP 5	R	PP	24
D5.9	Progress report on PGZ1 experiment at Bure	WP 5	R	PP	24
D5.10	Implementation of a gas tracer equation in code_bright coupled the existing formulation. Examples of problems to be modeled.	WP 5	R	PP	24

D3.15	Results of the tests on bentonite (part 1)	WP 3	R	PP	25
D3.16	Results of the tests on concrete (part 2)	WP 3	R	PP	26
D3.17	Report on conceptual design of the gas borehole experiment	WP 3	R	PP	30
D3.18	Report on experimental borehole results	WP 3	R	PP	30
D3.19	Technical notes on bentonite and concrete experiments	WP 3	R	PP	30
D3.20	Report on bentonite laboratory experiments	WP 3	R	PP	30
D4.14	Progress report – baseline hydraulic measurements	WP 4	R	PP	30
D5.11	Opalinus clay gas induced fractures	WP 5	R	PP	30
D2.4	Experimental progress	WP 2	R	PU	36
D0.6	Workshops on project outcomes	WP 0	O	PU	36 - 50
D3.21	Models of *in situ* gas flow experiments	WP 3	R	PP	36
D3.22	Internal reports on numerical experiments	WP 3	R	PP	36
D3.23	Experimental results and interpretations (bentonite)	WP 3	R	PP	36
D3.24	Poromechanical effects and water displacement (bentonite/argillite interface)	WP 3	R	PP	36
D4.15-R	**Preliminary report - numerical simulation of lab and field tests**	**WP 4**	**R**	**PP**	**36**
D5.12-R	**Report on modelling and interpretation of *in situ* gas migration experiments**	**WP 5**	**R**	**PP**	**36**
D5.13	HM modelling of PGZ and parameters studies	WP 5	R	PP	36
D4.16-R	**Final report – field results and conceptual understanding of self-sealing processes (Opalinus Clay)**	**WP 4**	**R**	**PU**	**40**
D5.14	Opalinus clay 2-phase flow parameters	WP 5	R	PP	40
D5.15	Modelling and interpretation of in situ gas migration experiments	WP 5	R	PP	42
D3.25	Experimental results and interpretation (in terms of processes)	WP 3	R	PU	42

D3.26	Results and interpretation of the gas migration tests (concrete)	WP 3	R	PP	42
D4.17	Experimental results and interpretation (process understanding of argillaceous and crystalline formations)	WP 4	R	PP	42
D4.18	Experimental results and interpretation (process understanding within URL)	WP 4	R	PP	42
D5.16	Key gas migration processes in the Callovo-Oxfordian argilite	WP 5	R	PU	42
D5.17	Experimental results and interpretation (in terms of processes) (laboratory and *in situ* gas migration experiments)	WP 5	R	PU	42
D3.27	Results of the tests on bentonite (part 2)	WP 3	R	PP	44
D2.5-R	**Synthesis of experimental processes governing gas generation**	**WP 2**	**R**	**PU**	**45**
D3.28	Report on experimental results and modelling interpretation (HLW cell)	WP 3	R	PP	45
D3.29	Final report on models of gas migration in bentonite	WP 3	R	PP	45
D3.30	Final report: test results / numerical parameter sets (bentonite/argillite interface)	WP 3	R	PP	46
D4.19	Final report – field results and conceptual understanding of self-sealing processes (Boom Clay)	WP 4	R	PU	46
D4.20	Final report – field results and conceptual understanding of gas flow (crystalline rock)	WP 4	R	PU	46
D4.21	Final report – modelling gas and water flow in plastic and indurated clay EDZ's	WP 4	R	PU	46
D4.22	Final report - numerical simulation of lab and field tests (disturbed host rock formations)	WP 4	R	PU	46
D4.23	Final report – Simulation results (HG-A)	WP 4	R	PU	46
D5.18	Experimental comparisons and inverse method application (undisturbed host rock formations)	WP 5	R	PP	46

D0.7-R	**Report on the scientific achievements of FORGE**	**All WP**	**R**	**PU**	**48**
D1.5-R	**Synthesis Report: Updated treatment of gas generation and migration in performance assessment**	**WP 1**	**R**	**PU**	**48**
D1.6-R	**Final report(s) on repository-scale numerical simulations of gas migration**	**WP 1**	**R**	**PU**	**48**
D3.31	Final modelling results and progress in gas transport modelling	WP 3	R	PU	48
D3.32	Report on gas movement in EBS system under repository scale	WP 3	R	PU	48
D3.33	Final report on key gas migration processes in compact buffer	WP 3	R	PP	48
D3.34	Final report on sand/bentonite laboratory experiments	WP 3	R	PP	48
D3.35	Experimental results with argillite-bentonite tubes	WP 3	R	PP	48
D3.36	Final report on interface laboratory experiments	WP 3	R	PP	48
D3.37	Final report on carbon dioxide reactions with repository cement	WP 3	R	PP	48
D3.38-R	**Experiments and modelling on the behaviour of EBS**	**WP 3**	**R**	**PU**	**48**
D4.24-R	**Experiments and modelling of EDZ behaviour in argillaceous and crystalline rocks**	**WP 4**	**R**	**PU**	**48**
D5.19-R	**Experiments and modelling of gas migration processes in undisturbed rocks**	**WP 5**	**R**	**PU**	**48**
D0.8-R	**Overview report summarising key outcomes from the project**	**WP 0**	**R**	**PU**	**49**
D0.9	Workshop proceedings and/or book(s) published on principal outcomes of the project	WP 0	O	PP	50+

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