FIRST PROJECT FACT SHEET
EUROPEAN UNION CO-FUNDED PROJECT

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COMPETITIVE LOW-CARBON ENERGY

Project acronym:

SECURe

Subsurface Evaluation of Carbon Capture and Storage and Unconventional Risk

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1. SUMMARY

Subsurface Evaluation of CCS and Unconventional Risks (SECURe) will gather unbiased, impartial scientific evidence for risk mitigation and monitoring for environmental protection to underpin subsurface geoenergy development. The main outputs of SECURe will comprise recommendations for best practice for unconventional hydrocarbon production and geological CO2 storage. The project is at an early stage, beginning June 2018.

The project will develop monitoring and mitigation strategies for the full geoenergy project lifecycle; by assessing plausible hazards and monitoring associated environmental risks. This will be achieved through a program of experimental research and advanced technology development that will be demonstrated at commercial and research facilities to formulate best practice. We will meet stakeholder needs; from the design of monitoring and mitigation strategies relevant to operators and regulators, to developing communication strategies to provide a greater level of understanding of the potential impacts.

The SECURe partnership comprises major research and commercial organisations from countries that host shale gas and CCS industries at different stages of operation (from permitted to closed). We will form a durable international partnership with non-European groups; providing international access to study sites, creating links between projects and increasing our collective capability through exchange of scientific staff.

2. PROJECT SCOPE

The potential environmental impacts of shale gas and CCS technologies need to be better understood. The recent expansion of the unconventional gas industry in North America and its potential advent in Europe has generated public concern regarding the potential detrimental impacts on air, water and the land. Mitigation of the steep rise of greenhouse gas emissions and the related climate changes will need to include CO_2 storage in deep geological reservoirs. Both activities utilise deep-lying geological formations and may induce similar impacts via similar pathways, including induced seismicity, detrimental fluid migration and displacement of brines.

A key objective of SECURe is to integrate the broad expertise that the consortium maintains in the fields of both CO_2 storage *and* shale gas monitoring across the key spatial and temporal domains relevant to geoenergy project development (Figure 1). The membership of the SECURe partnership is a major asset as it includes several National Geological Surveys and major research organisations from EU member states that host shale gas and CCS projects at different stages of operation (from permitted to closed), as well as companies actively involved in the deployment of CCS and exploitation of unconventional gas.

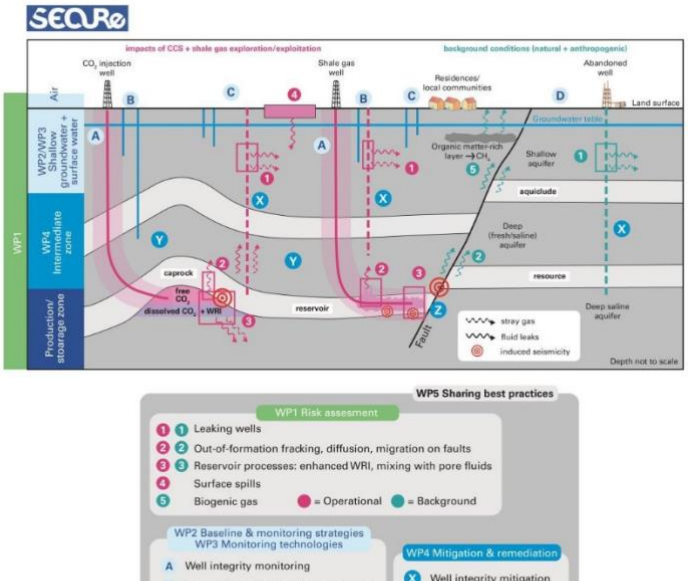


Figure 1 **The SECURe Concept – providing best practice recommendations across these domains for the protection of groundwaters, surface environments and local communities.**

The SECURe project has the following specific objectives:

1. To produce a risk assessment framework for assessing the hazards and likelihoods of specific risks that relate to the protection of the environment in CO_2 storage and shale gas

operations.

2. To demonstrate best practice in establishing baseline conditions for subsurface geoenergy operations by working across a network of both commercial, pilot and research-scale sites in Europe and internationally, underpinned by laboratory measurements and model up-scaling to the field scale.
3. To develop new technologies to improve the detection and monitoring of environmental impacts related to geoenergy projects.
4. To investigate new methods for remediating potential environmental impacts of geoenergy projects specifically to reduce leakage from wells or naturally occurring permeable pathways.
5. To develop best practice guidelines for the shale gas and CO_2 storage industries specifically in environmental baseline assessment and monitoring; the intention is that these will not unduly delay the development of new technologies or innovations.
6. To understand the needs of a range of stakeholders, including local communities, and to engage them through the development of appropriate communication strategies, including participatory monitoring and through the education of early-career researchers.
7. To leverage best practice through collaboration with leading groups in the USA, Canada and Australia.

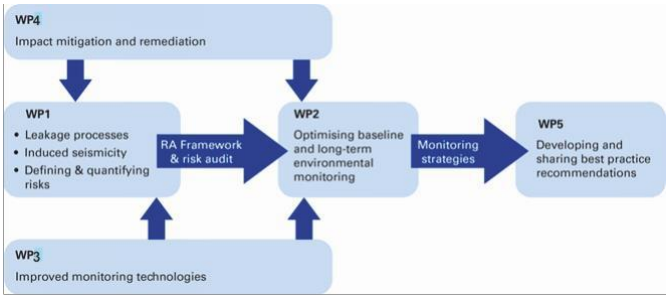
SECURe will achieve this by:

1. Developing frameworks for quantifying and managing risks including impact assessment (monitoring and characterisation) for developing and implementing effective remedial strategies and to contribute to the evidence base underpinning policy making;
2. Investigating leakage processes and impacts at the laboratory and field-scale using a portfolio of existing European and North American facilities and field sites to better characterise and quantify relevant risk factors;
3. Developing, applying and testing a range of monitoring technologies, systems and strategies to contribute to effective (best practice) risk evaluation, establishment of baseline conditions and monitoring and management of impacts;
4. Explore opportunities of participative monitoring as an aspect of public engagement.
5. Provide a series of recommendations for best practice that can be used as a dataset to inform effective regulation and monitoring strategies for shale gas and CCS sites.

3. PROJECT TECHNICAL DESCRIPTION & IMPLEMENTATION

The project is delivered by 7 work packages (WP). WP6 is the management work package, led by NERC-BGS. It's function is to co-ordinate and administrate the legal and financial aspects of the project, and communicate with the European Commission. WP7 is concerned with Ethics related to the project.

The technical components of the project are operated through WP1 – 4 (see panel). These feed into WP5, which has the remit of developing and sharing best practice recommendations, which is the main output of the consortium.



In **WP1** well integrity, fractures, fault permeability, induced seismicity and water quality impacts will be evaluated in geological settings typical for CO_2 injection and unconventional gas exploitation. In this context, numerical models that predict leakage and induced seismicity threats will be produced. Ultimately, this will result in a set of guidelines that permit conducting transparent and verifiable risk assessments. **WP2** will develop multi-scale strategies for environmental baseline assessment and operational to post operational monitoring. Synergies between approaches designed for CCS and unconventional gas operations will be explored. Emphasis will be on cost-effective monitoring of the whole lifecycle of both subsurface energy operations. **WP3** enhance seal and fracture characterisation by developing state-of-the-art sensors to monitor flow leaks and geomechanical stresses. Within the scope of WP3, new technologies will be tested to improve sensor measurement thresholds for toxic quantities that fall below the detection limit of current state-of-the-art sensors. **WP4** contributes to the development and implementation of effective remedial and mitigation strategies for subsurface geoenergy operations. The

focus in WP4 lies on near well and far-field leakage monitoring and seismicity prediction and mitigation. **WP5** ties together the lessons learned in WPs 1–4 and will result in recommendations on best practice for maintaining and re-establishing baseline conditions on surface and in the subsurface. It will also provide models and best practice guidelines for participatory monitoring. WP5 aims to contribute to the development of commercial CCS and the responsible exploitation of shale gas reserves in Europe and the dissemination of information on these geoenergy operations to non-technical audiences such as policymakers and European citizens.

4. RESULTS ACHIEVED

At the end of the project, SECURe is anticipated to provide a legacy of:

1. Representative experimental and industrial field sites in the CCS and Shale Gas sectors, for deployment of a comprehensive suite of detection and monitoring methods as a proving ground for cutting edge technologies and to enable technology transfer between sectors;
2. A platform for international cooperation and future projects with focus on US and Canada, facilitating the exchange scientific knowledge and researchers;
3. A scientifically sound, unbiased and independent, pragmatic, and cost-effective best practice for baselining, monitoring, mitigation and remediation – within a risk-assessment framework and with community engagement;
4. Models and best practice guidelines for engaging different stakeholders including citizens through participatory monitoring
5. A formal continuous training programme for researchers and students [including post-project]
6. Dissemination of results through engagement with the public.

5. IMPACT

SECURe will address risks most often associated with the successful development of CO2 storage and unconventional hydrocarbons production (including the release and impacts of contaminants on groundwater quality, impacts on the atmosphere resulting from fugitive emissions, and impacts on the surface environment. Close links with the M4CE project will ensure enhanced impact of both projects in related areas (e.g., monitoring technologies and policy advice).

Replicability Strategies will be developed by SECURe to support commercial developers, regulators and policy makers and host communities in their planning and joint discussions to allow them to make informed decisions on ways to use best available technologies (BAT) in the project development.

Socio-economics Importantly the resulting 'best practice' in stakeholder engagement will include practical demonstrations of citizen science, through community-based participatory monitoring, as well as results from improved definitions and understanding of ethical and responsible research and innovation issues.

Environment SECURe will contribute significantly to the improved understanding of both natural and engineered pathways for CO2 and natural gas and related fluids through field- and lab-scale experiments as well as simulations to both upscale experimental results and provide further quantifiable insight into the relative importance and timings of these impacts.

Market Transformation Specific low Technology Readiness Level (TRL) technologies will be targeted in SECURe to improve their application in CO2 storage and/or unconventional hydrocarbon production. Firstly, we are developing tools that will improve the detectability of stray gases at the surface and in the subsurface, improve capabilities for attributing stray gases to specific subsurface operations, or define detection limits. Secondly, by demonstrating the integration of different portfolios of monitoring technologies in new, innovative ways, SECURe will support industry, policy-makers and regulators with the development of standard protocols for monitoring design, including, *inter alia*, the appropriate spatial and temporal sampling densities, methods of tool selection, data management and reporting.

Policy SECURe will develop pragmatic recommendations that, as a minimum, meet with current legislation. This will be achieved by including policymakers and regulators on the SECURe Advisory Board plus reviews of

the relevant legislation in WPs1 and 2. Direct discussions with industrial and other commercial organisations is planned as part WP5, which will feed into the compilation of Best Practice recommendations that are fit-for-purpose and appropriate to the technologies and processes concerned.