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D4.9. Joint Research Activities – Report 2

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CGS EUROPE REPORT ON JOINT RESEARCH ACTIVITIES

1 Objectives

CGS Europe is a Pan-European Coordination Action and one of its main goals is to widespread CCS technologies and related activities within all participant countries. CGS Europe partners are mainly scientific organizations, but there are also national authorities and technology appliers. In that situation, to reach that goal, CGS Europe programmed an entire Work Package (WP4) dedicated to "Knowledge Development", including a specific task that aims at helping the members to (at least) partially align their research programmes. Other tasks in WP4 also contribute to sharing knowledge and experiences through workshops and staff exchanges.

This report summarizes actions that have been taken within CGS Europe in order to optimize cooperation between members looking ahead to common activities in the short and medium term. One of the key issues is the gap of knowledge between participants and also some very important differences in the support received by CCS research from National governments. This is a strategic issue and CGS Europe activities can help to reduce the gap and also to encourage investment from national governments into CCS research funding programmes.

The lines of action carried out during this first period are listed next and will keep going during the next year:

- To have a dynamic overview of participant activities related to geological storage of CO_2
- To promote transposition of EU Directive on Geological Storage of Carbon Dioxide and further legislation
- To create synergies between participants towards the creation of a European Atlas on CO_2 storages
- To promote contact and participation of CGS Europe partners in research and other active bodies related to Carbon Geological Storage (ZEP, EERA…)

The goal of CGS Europe for the next period is to increase the number of areas of activity and also the intensity of them. In that sense, following recommendations from the Advisory Body, cooperation in the fields of modelling and influence of impurities will be specially supported.

2 Overview of participant activities

To obtain global information on research activities, a questionnaire was sent to all participants. This questionnaire consisted of five questions about participant and national activities related to different technologies and a variety of research areas related to those technologies. A detailed description of this questionnaire can be read in Deliverable 4.8 “Joint Research Activities”, issued in Month 6 of the project. In this report, we will summarize the most interesting outcomes.

As a first and positive impression, it can be concluded that all research areas identified by ZEP are currently part of the objectives of more than one CGS Europe partner, i.e. cooperation can be promoted in all research areas. Moreover, most partners have expressed the will of cooperation in the research areas they are researching at the present moment, plus in other areas where they might have a field of interest.

On the other hand, research is not well balanced, neither between CGS Europe participants nor their countries. Capacity assessment technologies register the highest activities, probably because in a wide range of countries there is a need to clarify if geological storage space is available for the great amounts of CO_2 that may be potentially captured. Therefore, in many other fields of expertise, methodological standards and guidance documents are being defined, before researching new methods, especially in so called “follower” countries.

Meanwhile, those countries where demonstration activities are being carried out or planned have stronger research on technologies that need to be refined in the short term to allow CCS deployment, for example modelling or monitoring. Other research areas, like those related to wells or mitigation and remediation are being only partially studied because they might be considered for the mid term.

Many research activities around all these technologies are mainly being funded by the EU and there are very few countries (Netherlands, France, Norway…) with strong national funding programmes. It is highly likely that some other countries will have stronger research when planned EEPR and NER300 demo projects are finally developed. Moreover, very few private companies are funding research in all these areas all over Europe.

2.1 Recommendations

Advantage should be taken of the wide spreading of capacity assessment research in participant countries, towards the compilation of a European storage atlas that can be comparable to those developed in the United States, Australia and Canada. This cooperation should also be applied to land use planning and sources and sinks matching infrastructures.

Developments in “forerunner” countries must be used to build confidence in the rest of Europe, encouraging national and regional authorities to create stronger research programmes that will lead to new developments all over Europe. That is the case of ongoing and planned pilot and demonstration projects that should create an

adequate base for new pilots in more countries. As a more particular case, for example, reactive transport modelling will help mineral sequestration research and, therefore, cooperation between teams that are developing those models in some countries and other teams researching mineral sequestration must be promoted. CGS Europe staff exchange programme and internal knowledge workshops will be good tools for achieving these objectives.

Human resources committed by CGS Europe participants in different research areas have to be quantified in order to identify real opportunities of cooperation that may become real through an active participation in the EERA CCS Joint Programme. It is very likely that some countries will have to create joint research teams in order to have a critical mass for research in their fields at a European level.

Further analysis of CGS Europe partners abilities need to be carried out. CO_2 geological storage is a site specific activity and exploration and monitoring techniques needed may be very different from one country to another and also for different geological settings. National research programmes are a key issue in this point, as they will allow researchers from participant countries to be in the right position to participate in European programmes. Many partners have suggested that legislation should also be considered a priority research area.

3 Activities on EU Directive transposition

The first knowledge-sharing workshop organized by CGS Europe in Venice in May 2011 treated different scientific issues related to the status of the process of transposition of the EU Directive on geological storage of carbon dioxide to national legislations. This workshop was very successful both in the quality of presentations and in the number of assistants, who confirmed the conclusion obtained in the questionnaire described above, promoting further participation of research institutions in the regulation process.

As a result of this workshop, several actions were taken to accomplish this goal. First of all, CGS Europe gave support to an initiative of ICF International to participate in a tender called by the European Commission to assess on the implementation of new CO_2 storage laws in Member States. Although the bid was not successful it helped to set a core group of CGS Europe partners to cooperate and share experiences related to regulation processes in their countries.

This group of partners has prepared an abstract of an article about regulation issues at a European level (Annex 2). This abstract has been sent to the organization of the 11^{th} Congress on Greenhouse Gases Technologies (GHGT-11) that will take place in Kyoto on November 2012. If accepted, a full paper will be submitted and a presentation will be given in Kyoto.

Moreover, a more detailed article including case studies in different Member States has been prepared in order to be sent to the International Journal on Climate Change, seeking impact in the scientific community, in order to involve researchers in the elaboration and monitoring of new laws. The participation of researchers in these processes will have a favourable impact on the content of regulations. Geological storage laws and their implementation in different countries but also the monitoring of exploration and use permits will deeply influence the deployment of CCS in Europe. Therefore, the study of conflicts and technical difficulties and their possible solutions should also be part of a research strategy.

4 Cooperation towards a European Atlas of storage sites

As stated above, storage capacity assessment is one of the main activities shared by CGS Europe partners. A great number of project participants have been involved in relevant research projects in this field, such as Joule, GESTCO or EU GeoCapacity. In addition, many researchers from CGS Europe partners are also working in storage projects at national or European levels.

In this situation, the European Commission called for bids aiming to the elaboration of a database that could hold all publicly available information about potential carbon dioxide geological storage sites. CGS Europe, as a consortium, considers that its partners are very capable of carrying out this work, taking into account the amount of information generated by them in the past years. Contacts were made with other networks and associations interested in this field (EuroGeoSurveys, ENeRG…) in order to build a proposal and answer the bid.

Finally, a consortium headed by the Geological Survey of Denmark and Greenland (GEUS) in cooperation with the British Geological Survey (BGS) and the Netherlands Geological Survey (TNO) took the responsibility of coordinating and presenting a proposal to the Commission. In this proposal, a great amount of CGS Europe partners have taken part as subcontractors to develop work in their home countries. This proposal denominated CO2Stop was presented in August 2011 and finally won the bid in December. CO2Stop began working in January 2012.

CO2Stop has established 4 tasks to achieve a complete and realistic database of storage sites in Europe. These 4 tasks are briefly described here:

Task 1: Develop a methodology. This task will consist on the development of a harmonised set of storage capacity parameters, consistent with the database hosted by the European Commission (JRC), identifying those parameters that are available for making public.

Task 2: Provide datasets. This task will have the goal of populating a database with data sets for the 27 Member States plus Norway, meeting the specifications developed in Task 1.

Task 3: Develop formulae. In this task, some formulae will be agreed in order to assess storage capacity both in saline aquifers and hydrocarbon fields. These formulae will be based on those developed by the CSLF that were previously used in the GeoCapacity project.

Task 4: Provide estimations. Finally, CO_2 storage capacity estimations of every individual unit of assessment included in the study will be supplied. This will include total estimates for each jurisdiction, storage capacity in mapped traps and storage capacity in hydrocarbon fields alone.

CGS Europe will support the dissemination of results from CO2Stop and will make efforts to keep on working towards the generation of an Atlas of CO_2 sinks in Europe that can be compared to those elaborated in the United States and Australia. This Atlas would be a powerful tool for Companies and Administrations in order to plan their strategies against Climate Change.

5 Cooperation with other initiatives promoting (or on) CCS research

One of the compromises acquired by CGS Europe partnership with the European Commission was to have close links with other relevant CCS research agents, such as the Zero Emission Platform (ZEP) or the CCS Joint Programme of the European Energy Research Alliance (EERA). During this period, CGS Europe has taken some actions in order to establish these links and also to define cooperation and synergies in several sectors.

CGS Europe decided to take into account the ZEP recommendations about research needed for CCS deployment in order to have a previous knowledge of the situation of research in participant countries (Annex 1). Later on, CGS Europe has been invited to participate in the Working Group of Storage Infrastructures promoted by the Technology Task Force of ZEP. First meeting will take place in Brussels on March 20th 2012. CGS Europe intends to have a very important role in the evolution of this working group.

Also a certain amount of partners from CGS Europe are involved in the EERA sub programme on CO_2 geological storage. One of CGS Europe's goals is to encourage further participation of its partners in the Alliance and also in other initiatives that may lead to a more efficient CCS research in Europe.

6 Forthcoming actions

CGS Europe will keep on working on the described lines of action. Regarding the dynamic overview of partner's activities and following recommendations made by the Advisory Board, a template was elaborated in order to have a detailed description of the areas of specialization of each research institute. This template will be soon uploaded to the website and filled by all project participants.

All partners will follow CO_2 storage legislation processes in their countries. The status of legislation will be one of the key factors in the deployment of CCS technologies across Europe and CGS Europe is active at European and national scales: If it is possible, partners will support the generation of regulation in their countries as it was agreed that a scientific point of view is needed in the redaction of CO_2 storage legislation.

CGS Europe will also support the development of CO2Stop and further work for the elaboration of a CO_2 Storage Atlas of Europe, linked to the OneGeology system. A CO_2 Storage Atlas could be something more than a data repository, considering detailed analysis of the quality and reliability of the information used, calculation methodologies, modelling and others.

CGS Europe knowledge development activities will include closer cooperation with ZEP, through co-leading the Working Group of Storage Infrastructures, supporting generation of pilot and demonstration projects. These projects may be the key to reach wider scientific knowledge and also public awareness.

It is a goal for CGS Europe in the next period to increase the fields of cooperation between participants. In this issue, Knowledge Sharing Workshops are very important, considering one of the outcomes of each workshop is a list of potential actions and projects that can be carried out in the next years. For example, in October 2011 a workshop on natural analogues was held in Germany and there was a wide consensus about research needs in this area (see Deliverable 4.3). Efforts need to be taken in order to produce real results in this and other areas.

Following the recommendations of the Advisory Body, the next Knowledge Sharing Workshop, which is committed to results from National Research Programmes, will have a special session on modelling activities. The development and verification of more complete and reliable models are a key factor to gain public support of CCS technologies.

Annexes

ANNEX I

QUESTIONNAIRE ON RESEARCH ACTIVITIES BY CGS EUROPE PARTNERS

BGR

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration				no		
	Drilling technologies				no		
	Completion				no		
	Leak detection			yes, details are in Comments column	no		Different topics funded by
	Fracturing technologies				no		"Geotechnologien" programme by Federal Ministry of Education and Research
	Best practices	partially, not our core business			no		COORETEC programme by Federal Ministry of Economics and Technology
	Well repairing				no		
	Leak characterization				no		
	Monitoring	partially, not our core business	yes		no	yes, details are in Comments column	
Capacity assessement	Methodological standards	yes, our core business	yes		no		
	Matched capacity	yes, our core business	yes	yes, details are in Comments column	no		
	Storage atlas	yes, our core business	yes		no		Private funding on basis of bilateral agreements only
	Saline aquifers	yes, our core business	yes		no		
Mitigation and remediation	Rapid remediation				no		
	Mantainance and restoring of seals				no		
	Excessive pressure alleviation				no		
	Effects on environment				no		
	Dverting CO2 from pathways				no		
Land planning and infrastructure	Network infrastructures				no		
	Operational integrated systems				no		
	Multi-sources and sinks systems				no		
	Combined uses	yes, our core business	yes		no		
	Cross-border schemes	yes, our core business	yes		no		
	conflicts	yes, our core business	yes		no		
Complex management	Fluid management				no		
	Pressure management	yes, our core business			no		
	Injectivity guidelines	partially, not our core business			no		
	Dissolution favouring	partially, not our core business			no		
	Mineralization favouring	partially, not our core business			no		
	Deep biological activity	yes, our core business	yes	yes, details are in Comments column	no		
	Several streams injection	yes, our core business			no		
	Efficiency standards	yes, our core business			no		
	Safety standards	yes, our core business	yes		no		
Environmental impact	CO2 impacts	yes, our core business	yes		no		
	Remote sensing techniques	partially, not our core business	don't know	yes, details are in Comments column	no		
	Experimental sites	partially, not our core business	don't know		no		
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes		no		
	Sensitivity analysis	partially, not our core business	yes		no		
	Guidance documents	yes, our core business	yes		no		
	Upscaling methodologies	partially, not our core business			no		
	Heterogeneities	partially, not our core business			no		
	Effects of impurities	yes, our core business	yes	yes, details are in Comments column	no		
	Experiments	partially, not our core business			no		
Monitoring	Leakage detections	yes, our core business	yes		no		
	Leakage quantifications	yes, our core business	yes		no		
	Non intrusive methods	yes, our core business	yes	yes, details are in Comments column	no		
	High-level agreed standards	yes, our core business	yes		no		
	Monitoring requirements	yes, our core business	yes		no		

BGS

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	no	no	no	no	no	
	Drilling technologies	no	no	no	no	no	
	Completion	no	no	no	no	no	
	Leak detection	no	no	no	no	no	
	Fracturing technologies	no	no	no	no	no	
	Best practices	no	no	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	no	no	no	no	
	Monitoring	no	no	no	no	no	
Capacity assessement	Methodological standards	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Matched capacity	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Storage atlas	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Saline aquifers	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
Mitigation and remediation	Rapid remediation	no		no	no	no	
	Mantainance and restoring of seals	no		no	no	no	
	Excessive pressure alleviation	no		no	no	no	
	Effects on environment	no		no	no	no	
	Dverting CO2 from pathways	no		no	no	no	
Land planning and infrastructure	Network infrastructures	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Operational integrated systems	no		no	no	no	
	Multi-sources and sinks systems	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Combined uses	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Cross-border schemes	no		no	no	no	
	conflicts	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
Complex management	Fluid management	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Pressure management	no		no	no	no	
	Injectivity guidelines	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Dissolution favouring	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Mineralization favouring	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Deep biological activity	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Several streams injection	no		no	no	no	
	Efficiency standards	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Safety standards	no		no	no	no	
Environmental impact	CO2 impacts	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Remote sensing techniques	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Experimental sites	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Sensitivity analysis	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Guidance documents	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Upscaling methodologies	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Heterogeneities	partially, not our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Effects of impurities	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Experiments	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
Monitoring	Leakage detections	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Leakage quantifications	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Non intrusive methods	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	High-level agreed standards	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources
	Monitoring requirements	yes, our core business	yes	no	no	no	Cooperation not possible under CGS Europe funding - would have to come from other sources

BRGM

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Drilling technologies	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Completion	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Leak detection	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Fracturing technologies	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Best practices	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Well repairing	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Leak characterization	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Monitoring	partially, not our core business	don't know	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
Capacity assessement	Methodological standards	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Matched capacity	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Storage atlas	yes, our core business	**yes**	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Saline aquifers	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
Mitigation and remediation	Rapid remediation	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Mantainance and restoring of seals	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Excessive pressure alleviation	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Effects on environment	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Dverting CO2 from pathways	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
Land planning and infrastructure	Network infrastructures	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Operational integrated systems	partially, not our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Multi-sources and sinks systems	partially, not our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Combined uses	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Cross-border schemes	partially, not our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	conflicts	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
Complex management	Fluid management	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Pressure management	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Injectivity guidelines	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Dissolution favouring	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Mineralization favouring	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Deep biological activity	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Several streams injection	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Efficiency standards	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Safety standards	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
Environmental impact	CO2 impacts	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Remote sensing techniques	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Experimental sites	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Sensitivity analysis	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Guidance documents	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Upscaling methodologies	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Heterogeneities	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Effects of impurities	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	Specific contratcs with industrial companies
	Experiments	partially, not our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
Monitoring	Leakage detections	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Leakage quantifications	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Non intrusive methods	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	High-level agreed standards	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)
	Monitoring requirements	yes, our core business	yes	yes, details are in Comments column			SEED call from national research agency (open for bilateral or multilateral collaborations)

CzGS

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration						
	Drilling technologies						
	Completion						
	Leak detection						
	Fracturing technologies						
	Best practices						
	Well repairing						
	Leak characterization						
	Monitoring						
Capacity assessement	Methodological standards	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	TIP R&D programme of the Ministry of Industry
	Matched capacity	yes, our core business	yes	no	yes, details are in Comments column	no	TIP R&D programme of the Ministry of Industry
	Storage atlas	yes, our core business	yes	no	yes, details are in Comments column	no	TIP R&D programme of the Ministry of Industry
	Saline aquifers	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	TIP R&D programme of the Ministry of Industry
Mitigation and remediation	Rapid remediation						
	Mantainance and restoring of seals						
	Excessive pressure alleviation						
	Effects on environment						
	Dverting CO2 from pathways						
Land planning and infrastructure	Network infrastructures						
	Operational integrated systems						
	Multi-sources and sinks systems						
	Combined uses						
	Cross-border schemes						
	conflicts	partially, not our core business	yes	no	no	no	
Complex management	Fluid management						
	Pressure management						
	Injectivity guidelines						
	Dissolution favouring						
	Mineralization favouring						
	Deep biological activity	partially, not our core business	yes	don't know	don't know	no	Isotopic evidence of deep microbial CO2 reduction
	Several streams injection						
	Efficiency standards						
	Safety standards						
Environmental impact	CO2 impacts						
	Remote sensing techniques						
	Experimental sites						
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes	don't know	don't know	no	
	Sensitivity analysis	partially, not our core business	yes	don't know	don't know	no	
	Guidance documents						
	Upscaling methodologies						
	Heterogeneities						
	Effects of impurities						
	Experiments						
Monitoring	Leakage detections	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	Gas composition on site and lab analysis; TIP R&D programme of the Ministry of Industry
	Leakage quantifications	partially, not our core business	yes	no	no	no	Gas flow measurements; TIP R&D programme of the Ministry of Industry
	Non intrusive methods	partially, not our core business	yes	no	no	no	
	High-level agreed standards	partially, not our core business	yes	no	no	no	Calibration techniques of gas flow measurements
	Monitoring requirements	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	TIP R&D programme of the Ministry of Industry

ELGI

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	yes	no	no	no	
	Drilling technologies	no	no	no	no	no	
	Completion	no	no	no	no	no	
	Leak detection	no	no	no	no	no	
	Fracturing technologies	no	no	no	no	no	
	Best practices	no	no	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	no	no	no	no	
	Monitoring	no	no	no	no	no	
Capacity assessement	Methodological standards	no	no	no	no	no	
	Matched capacity	no	no	no	no	no	
	Storage atlas	yes, our core business	yes	yes	no	no	
	Saline aquifers	yes, our core business	yes	yes	no	no	
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	no	don't know	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	no	no	no	no	
	Operational integrated systems	no	no	no	no	no	
	Multi-sources and sinks systems	no	no	no	no	no	
	Combined uses	yes, our core business	yes, our core business	yes, our core business	no	no	
	Cross-border schemes	no	no	no	no	no	
	conflicts	yes, our core business	yes, our core business	yes, our core business	no	no	
Complex management	Fluid management	no	no	no	no	no	
	Pressure management	no	no	no	no	no	
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	partially, not our core business	yes	no	no	no	
	Mineralization favouring	partially, not our core business	yes	no	no	no	
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	no	no	no	no	
	Safety standards	no	no	no	no	no	
Environmental impact	CO2 impacts	no	no	no	no	no	
	Remote sensing techniques	no	no	no	no	no	
	Experimental sites	partially, not our core business	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	no	no	no	no	no	
	Sensitivity analysis	no	no	no	no	no	
	Guidance documents	yes, our core business	no	no	no	no	
	Upscaling methodologies	no	no	no	no	no	
	Heterogeneities	no	no	no	no	no	
	Effects of impurities	no	no	no	no	no	
	Experiments	yes, our core business	yes	no	no	no	
Monitoring	Leakage detections	partially, not our core business	yes	no	no	no	
	Leakage quantifications	partially, not our core business	yes	no	no	no	
	Non intrusive methods	yes, our core business	yes	no	no	no	
	High-level agreed standards	no	don't know	no	no	no	
	Monitoring requirements	yes, our core business	yes	no	no	no	

GEOINZ

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	no	no	no	no	don't know	
	Drilling technologies	no	no	no	no	don't know	
	Completion	no	no	no	no	don't know	
	Leak detection	no	no	no	no	don't know	
	Fracturing technologies	no	no	no	no	don't know	
	Best practices	no	no	no	no	don't know	
	Well repairing	no	no	no	no	don't know	
	Leak characterization	no	no	no	no	don't know	
	Monitoring	no	no	no	no	don't know	
Capacity assessement	Methodological standards	yes, our core business	yes	no	don't know	don't know	
	Matched capacity	partially, not our core business	yes	no	don't know	don't know	
	Storage atlas	yes, our core business	yes	yes, details are in Comments column	don't know	don't know	assessing theoretical/effective capacities for Slovenia on existing data
	Saline aquifers	yes, our core business	yes	yes, details are in Comments column	don't know	don't know	assessing theoretical/effective capacities for Slovenia on existing data
Mitigation and remediation	Rapid remediation	no	no	no	don't know	don't know	
	Mantainance and restoring of seals	no	no	no	don't know	don't know	
	Excessive pressure alleviation	no	no	no	don't know	don't know	
	Effects on environment	no	no	no	don't know	don't know	
	Dverting CO2 from pathways	no	no	no	don't know	don't know	
Land planning and infrastructure	Network infrastructures	partially, not our core business	yes	don't know	don't know	don't know	
	Operational integrated systems	no	yes	don't know	don't know	don't know	
	Multi-sources and sinks systems	no	yes	don't know	don't know	don't know	
	Combined uses	no	yes	don't know	don't know	don't know	
	Cross-border schemes	no	yes	don't know	don't know	don't know	
	conflicts	no	yes	don't know	don't know	don't know	
Complex management	Fluid management	no	no	no	don't know	don't know	
	Pressure management	no	no	no	don't know	don't know	
	Injectivity guidelines	no	no	no	don't know	don't know	
	Dissolution favouring	no	no	no	don't know	don't know	
	Mineralization favouring	no	no	no	don't know	don't know	
	Deep biological activity	no	no	no	don't know	don't know	
	Several streams injection	no	no	no	don't know	don't know	
	Efficiency standards	no	no	no	don't know	don't know	
	Safety standards	no	no	no	don't know	don't know	
Environmental impact	CO2 impacts	yes, our core business	yes	no	don't know	don't know	
	Remote sensing techniques	partially, not our core business	yes	no	don't know	don't know	
	Experimental sites	yes, our core business	yes	no	don't know	don't know	
Modelling	Flow, geomechanical and geochemical models	partially, not our core business	yes	no	don't know	don't know	
	Sensitivity analysis	partially, not our core business	yes	no	don't know	don't know	
	Guidance documents	partially, not our core business	yes	no	don't know	don't know	
	Upscaling methodologies	partially, not our core business	yes	no	don't know	don't know	
	Heterogeneities	partially, not our core business	yes	no	don't know	don't know	
	Effects of impurities	partially, not our core business	yes	no	don't know	don't know	
	Experiments	partially, not our core business	yes	no	don't know	don't know	
Monitoring	Leakage detections	yes, our core business	yes	no	don't know	don't know	
	Leakage quantifications	yes, our core business	yes	no	don't know	don't know	
	Non intrusive methods	yes, our core business	yes	no	don't know	don't know	
	High-level agreed standards	yes, our core business	yes	no	don't know	don't know	
	Monitoring requirements	yes, our core business	yes	no	don't know	don't know	

GEUS

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	yes, our core business	yes	no	no	yes, details are in Comments column	Companies operation in Denmark and Norway
	Drilling technologies	no	no	no	no	yes, details are in Comments column	Potential
	Completion	no	yes	no	no	no	
	Leak detection	no	yes	no	no	no	
	Fracturing technologies	no	no	no	no	no	
	Best practices	partially, not our core business	yes	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	yes	no	no	no	
	Monitoring	no	yes	no	no	no	
Capacity assessement	Methodological standards	partially, not our core business	yes	don't know	no	yes, details are in Comments column	Potential
	Matched capacity	partially, not our core business	yes	don't know	no	yes, details are in Comments column	Potential
	Storage atlas	yes, our core business	yes	don't know	no	yes, details are in Comments column	Potential
	Saline aquifers	yes, our core business	yes	don't know	no	yes, details are in Comments column	Potential
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	yes	yes	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	no	no	no	no	
	Operational integrated systems	no	no	no	no	no	
	Multi-sources and sinks systems	no	no	no	no	no	
	Combined uses	no	no	no	no	no	
	Cross-border schemes	no	no	no	no	no	
	conflicts	no	no	no	no	no	
Complex management	Fluid management	yes, our core business	yes	no	no	no	
	Pressure management	yes, our core business	yes	no	no	no	
	Injectivity guidelines	partially, not our core business	yes	no	no	no	
	Dissolution favouring	partially, not our core business	yes	no	no	no	
	Mineralization favouring	partially, not our core business	no	no	no	no	
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	no	no	no	no	
	Safety standards	no	no	no	no	no	
Environmental impact	CO2 impacts	partially, not our core business	yes	no	no	no	
	Remote sensing techniques	no	no	no	no	no	
	Experimental sites	partially, not our core business	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes	no	yes, details are in Com	no	Potential
	Sensitivity analysis	yes, our core business	yes	no	yes, details are in Com	no	Potential
	Guidance documents	yes, our core business	yes	no	yes, details are in Com	no	Potential
	Upscaling methodologies	yes, our core business	yes	no	yes, details are in Com	no	Potential
	Heterogeneities	yes, our core business	yes	no	yes, details are in Com	no	Potential
	Effects of impurities	partially, not our core business	yes	no	yes, details are in Com	no	Potential
	Experiments	yes, our core business	yes	no	yes, details are in Com	no	Potential
Monitoring	Leakage detections	partially, not our core business	yes	no	yes, details are in Com	no	Potential
	Leakage quantifications	partially, not our core business	yes	no	yes, details are in Com	no	Potential
	Non intrusive methods	partially, not our core business	yes	no	yes, details are in Com	no	Potential
	High-level agreed standards	partially, not our core business	yes	no	yes, details are in Com	no	Potential
	Monitoring requirements	partially, not our core business	yes	no	yes, details are in Com	no	Potential

GTC-BULGARIA

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	no	don't know	no	no	don't know	
	Drilling technologies	no	don't know	no	no	don't know	
	Completion	no	don't know	no	no	don't know	
	Leak detection	no	don't know	no	no	don't know	
	Fracturing technologies	no	don't know	no	no	don't know	
	Best practices	no	don't know	no	no	don't know	
	Well repairing	no	don't know	no	no	don't know	
	Leak characterization	no	don't know	no	no	don't know	
	Monitoring	no	don't know	no	no	don't know	
Capacity assessement	Methodological standards	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	some work has been done, new funding for increased activity becoming available, will then become part of core business
	Matched capacity	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	some work has been done, new funding for increased activity becoming available, will then become part of core business
	Storage atlas	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	some work has been done, new funding for increased activity becoming available, will then become part of core business
	Saline aquifers	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	some work has been done, new funding for increased activity becoming available, will then become part of core business
Mitigation and remediation	Rapid remediation	no	don't know	no	no	don't know	
	Mantainance and restoring of seals	no	don't know	no	no	don't know	
	Excessive pressure alleviation	no	don't know	no	no	don't know	
	Effects on environment	no	don't know	no	no	don't know	
	Dverting CO2 from pathways	no	don't know	no	no	don't know	
Land planning and infrastructure	Network infrastructures	no	don't know	no	no	don't know	
	Operational integrated systems	no	don't know	no	no	don't know	
	Multi-sources and sinks systems	no	don't know	no	no	don't know	
	Combined uses	no	don't know	no	no	don't know	
	Cross-border schemes	no	don't know	no	no	don't know	
	conflicts	no	don't know	no	no	don't know	
Complex management	Fluid management	no	don't know	no	no	don't know	
	Pressure management	no	don't know	no	no	don't know	
	Injectivity guidelines	no	don't know	no	no	don't know	
	Dissolution favouring	no	don't know	no	no	don't know	
	Mineralization favouring	no	don't know	no	no	don't know	
	Deep biological activity	no	don't know	no	no	don't know	
	Several streams injection	no	don't know	no	no	don't know	
	Efficiency standards	no	don't know	no	no	don't know	
	Safety standards	no	don't know	no	no	don't know	
Environmental impact	CO2 impacts	no	don't know	no	no	don't know	
	Remote sensing techniques	no	don't know	no	no	don't know	
	Experimental sites	no	don't know	no	no	don't know	
Modelling	Flow, geomechanical and geochemical models	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	university research funded by GSI
	Sensitivity analysis	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	university research funded by GSI
	Guidance documents	no	don't know	no	no	don't know	
	Upscaling methodologies	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	university research funded by GSI
	Heterogeneitities	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	university research funded by GSI
	Effects of impurities	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	university research funded by GSI
	Experiments	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	university research funded by GSI
Monitoring	Leakage detections	no	don't know	no	no	don't know	
	Leakage quantifications	no	don't know	no	no	don't know	
	Non intrusive methods	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	don't know	university research funded by GSI
	High-level agreed standards	no	don't know	no	no	don't know	
	Monitoring requirements	no	don't know	no	no	don't know	

GTC-LITHUANIA

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	yes	no	no	no	
	Drilling technologies	no	yes	no	no	no	
	Completion	no	no	no	no	no	
	Leak detection	no	no	no	no	no	
	Fracturing technologies	no	yes	no	no	no	
	Best practices	no	yes	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	no	no	no	no	
	Monitoring	no	no	no	no	no	
Capacity assessement	Methodological standards	no	yes	no	no	no	
	Matched capacity	no	yes	no	no	no	
	Storage atlas	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	Project of MIET 2010-2015
	Saline aquifers	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	Project of MIET 2010-2015
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	yes	no	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	don't know	no	no	no	
	Operational integrated systems	no	don't know	no	no	no	
	Multi-sources and sinks systems	no	don't know	no	no	no	
	Combined uses	no	don't know	no	no	no	
	Cross-border schemes	no	yes	no	no	no	
	conflicts	no	no	no	no	no	
Complex management	Fluid management	no	no	no	no	no	
	Pressure management	no	no	no	no	no	
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	partially, not our core business	yes	no	no	no	
	Mineralization favouring	partially, not our core business	yes	no	no	no	
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	yes	no	no	no	
	Safety standards	no	yes	no	no	no	
Environmental impact	CO2 impacts	no	yes	no	no	no	
	Remote sensing techniques	no	no	no	no	no	
	Experimental sites	no	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	no	don't know	no	no	no	
	Sensitivity analysis	no	don't know	no	no	no	
	Guidance documents	no	yes	no	no	no	
	Upscaling methodologies	no	no	no	no	no	
	Heterogeneities	no	no	no	no	no	
	Effects of impurities	no	no	no	no	no	
	Experiments	no	yes	no	no	no	
Monitoring	Leakage detections	no	yes	no	no	no	
	Leakage quantifications	no	no	no	no	no	
	Non intrusive methods	no	no	no	no	no	
	High-level agreed standards	no	no	no	no	no	
	Monitoring requirements	no	don't know	no	no	no	

GSI

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	yes	no	yes, details are in Com	no	
	Drilling technologies	no	no	no	no	no	
	Completion	no	no	no	no	no	
	Leak detection	no	no	no	no	no	
	Fracturing technologies	no	yes	no	no	no	
	Best practices	no	yes	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	no	no	no	no	
	Monitoring	no	no	no	no	no	
Capacity assessement	Methodological standards	no	yes	no	no	no	
	Matched capacity	no	yes	no	no	no	
	Storage atlas	partially, not our core business	yes	yes, details are in Comments column	no	no	National project 2011-2015
	Saline aquifers	partially, not our core business	yes	yes, details are in Comments column	no	no	National project 2011-2015
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	yes	no	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	don't know	no	no	no	
	Operational integrated systems	no	don't know	no	no	no	
	Multi-sources and sinks systems	no	don't know	no	no	no	
	Combined uses	no	don't know	no	no	no	
	Cross-border schemes	no	yes	no	no	no	
	conflicts	no	no	no	no	no	
Complex management	Fluid management	no	no	no	no	no	
	Pressure management	no	no	no	no	no	
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	partially, not our core business	yes	no	no	no	
	Mineralization favouring	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	no	Research program at the GTC and University of Technology
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	yes	no	no	no	
	Safety standards	no	yes	no	no	no	
Environmental impact	CO2 impacts	no	no	no	no	no	
	Remote sensing techniques	no	no	no	no	no	
	Experimental sites	no	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	no	yes	no	no	no	
	Sensitivity analysis	no	don't know	no	no	no	
	Guidance documents	no	yes	no	no	no	National project 2011-2015
	Upscaling methodologies	no	no	no	no	no	
	Heterogeneities	no	no	no	no	no	
	Effects of impurities	no	no	no	no	no	
	Experiments	no	yes	no	no	no	
Monitoring	Leakage detections	no	yes	no	no	no	
	Leakage quantifications	no	no	no	no	no	
	Non intrusive methods	no	no	no	no	no	
	High-level agreed standards	no	no	no	no	no	
	Monitoring requirements	no	don't know	no	no	no	

GTK

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	no					
	Drilling technologies	no					
	Completion	no					
	Leak detection	no					
	Fracturing technologies	no					
	Best practices	partially, not our core business					In other environmental business areas than CCS
	Well repairing	no					
	Leak characterization	no					
	Monitoring	partially, not our core business					In other environmental business areas than CCS
Capacity assessement	Methodological standards	no					
	Matched capacity	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column		National R & D projects
	Storage atlas	partially, not our core business	yes	yes, details are in Comments column			CCS Finland Project (2008-2010)
	Saline aquifers	no					
Mitigation and remediation	Rapid remediation	no					
	Mantainance and restoring of seals	no					
	Excessive pressure alleviation	no					
	Effects on environment	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column		National R & D projects
	Dverting CO2 from pathways	no					
Land planning and infrastructure	Network infrastructures	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	National R & D projects
	Operational integrated systems	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	National R & D projects
	Multi-sources and sinks systems	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	National R & D projects
	Combined uses	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	National R & D projects
	Cross-border schemes	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	National R & D projects
	conflicts	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	National R & D projects
Complex management	Fluid management	partially, not our core business					
	Pressure management	partially, not our core business					
	Injectivity guidelines	no					
	Dissolution favouring	partially, not our core business					In other geological business areas than CCS
	Mineralization favouring	partially, not our core business					In other geological business areas than CCS
	Deep biological activity	partially, not our core business					In other geological business areas than CCS
	Several streams injection	no					
	Efficiency standards	no					
	Safety standards	no					
Environmental impact	CO2 impacts	partially, not our core business		yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	In other environmental business areas than CCS
	Remote sensing techniques	partially, not our core business					In other environmental business areas than CCS
	Experimental sites	partially, not our core business					In other environmental business areas than CCS
Modelling	Flow, geomechanical and geochemical models	no					In other environmental and geological business areas than CCS
	Sensitivity analysis	no					In other environmental and geological business areas than CCS
	Guidance documents	no					In other environmental and geological business areas than CCS
	Upscaling methodologies	no					In other environmental and geological business areas than CCS
	Heterogeneities	no					In other environmental and geological business areas than CCS
	Effects of impurities	no					In other environmental and geological business areas than CCS
	Experiments	no					In other environmental and geological business areas than CCS
Monitoring	Leakage detections	no					
	Leakage quantifications	no					
	Non intrusive methods	no					
	High-level agreed standards	no					
	Monitoring requirements	no					

IGME-GR

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core b	no	no	yes, details are in Comments column	no	it is expected to start in 2011
	Drilling technologies	no	yes	no	no	no	
	Completion	no	yes	no	no	no	
	Leak detection	no	yes	no	don't know	no	
	Fracturing technologies	no	yes	no	don't know	no	
	Best practices	no	yes	no	no	no	
	Well repairing	no	yes	no	no	no	
	Leak characterization	no	yes	no	no	no	
	Monitoring	no	yes	no	no	no	
Capacity assessement	Methodological standards	partially, not our core b	yes	yes, details are in Comments column	yes, details are in Comments column	no	it is expected to start in 2011
	Matched capacity	partially, not our core b	yes	yes, details are in Comments column	yes, details are in Comments column	no	it is expected to start in 2011
	Storage atlas	partially, not our core b	yes	yes, details are in Comments column	yes, details are in Comments column	no	it is expected to start in 2011
	Saline aquifers	partially, not our core b	yes	yes, details are in Comments column	yes, details are in Comments column	no	it is expected to start in 2011
Mitigation and remediation	Rapid remediation	no	yes	no	no	no	
	Mantainance and restoring of seals	no	yes	no	no	no	
	Excessive pressure alleviation	no	yes	no	no	no	
	Effects on environment	partially, not our core b	yes	no	no	no	
	Dverting CO2 from pathways	no	yes	no	no	no	
Land planning and infrastructure	Network infrastructures	no	yes	no	no	no	
	Operational integrated systems	no	yes	no	no	no	
	Multi-sources and sinks systems	no	yes	no	no	no	
	Combined uses	no	yes	no	no	no	
	Cross-border schemes	no	yes	no	no	no	
	conflicts	no	yes	no	no	no	
Complex management	Fluid management	no	yes	no	no	no	
	Pressure management	no	yes	no	no	no	
	Injectivity guidelines	no	yes	no	no	no	
	Dissolution favouring	no	yes	no	no	no	
	Mineralization favouring	no	yes	no	no	no	
	Deep biological activity	no	yes	no	no	no	
	Several streams injection	no	yes	no	no	no	
	Efficiency standards	no	yes	no	no	no	
	Safety standards	no	yes	no	no	no	
Environmental impact	CO2 impacts	partially, not our core b	yes	no	yes, details are in Comments column	no	the program will start in 2012
	Remote sensing techniques	partially, not our core b	yes	no	yes, details are in Comments column	no	the program will start in 2012
	Experimental sites	no	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	partially, not our core b	yes	no	no	no	
	Sensitivity analysis	no	yes	no	no	no	
	Guidance documents	no	yes	no	no	no	
	Upscaling methodologies	no	yes	no	no	no	
	Heterogeneities	no	yes	no	no	no	
	Effects of impurities	no	yes	no	no	no	
	Experiments	no	yes	no	no	no	
Monitoring	Leakage detections	no	yes	no	no	no	
	Leakage quantifications	no	yes	no	no	no	
	Non intrusive methods	no	yes	no	no	no	
	High-level agreed standards	no	yes	no	no	no	
	Monitoring requirements	no	yes	no	no	no	

IRIS

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	no	yes	yes, details are in Comments column	In Norway all areas of CCS research are covered by the national research prograr CLIMIT www.climit.no. There are funds for academic research as well as demontration and pilot projects.	The major oil companies are likely private sponsors for CCS projects.	In Norway all areas of CCS reserach are covered by the CLIMIT programme www.climit.no. There are funds for academic research as well as demontration and pilot projects.
	Drilling technologies	yes, our core business	yes	yes, details are in Comments column			The major oil companies are likely private sponsors for CCS project
	Completion	no	yes	yes, details are in Comments column			
	Leak detection	no	yes	yes, details are in Comments column			
	Fracturing technologies	no	yes	yes, details are in Comments column			
	Best practices	yes, our core business	yes	yes, details are in Comments column			
	Well repairing	no	yes	yes, details are in Comments column			
	Leak characterization	no	yes	yes, details are in Comments column			
	Monitoring	yes, our core business	yes	yes, details are in Comments column			
Capacity assessement	Methodological standards	yes, our core business	yes	yes, details are in Comments column			
	Matched capacity	yes, our core business	yes	yes, details are in Comments column			
	Storage atlas	yes, our core business	yes	yes, details are in Comments column			
	Saline aquifers	partially, not our core business	yes	yes, details are in Comments column			
Mitigation and remediation	Rapid remediation	no					
	Mantainance and restoring of seals	no					
	Excessive pressure alleviation	no					
	Effects on environment	no					
	Dverting CO2 from pathways	no					
Land planning and infrastructure	Network infrastructures	no					
	Operational integrated systems	no					
	Multi-sources and sinks systems	no					
	Combined uses	no					
	Cross-border schemes	no					
	conflicts	no					
Complex management	Fluid management	no					
	Pressure management	no					
	Injectivity guidelines	no					
	Dissolution favouring	no					
	Mineralization favouring	no					
	Deep biological activity	no					
	Several streams injection	no					
	Efficiency standards	no					
	Safety standards	no					
Environmental impact	CO2 impacts	no					
	Remote sensing techniques	no					
	Experimental sites	no					
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	
	Sensitivity analysis	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	
	Guidance documents	no	yes	yes, details are in Comments column		yes, details are in Comments column	
	Upscaling methodologies	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	
	Heterogeneities	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	
	Effects of impurities	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	
	Experiments	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	
Monitoring	Leakage detections	partially, not our core business	yes	yes, details are in Comments column			
	Leakage quantifications	partially, not our core business	yes	yes, details are in Comments column			
	Non intrusive methods	partially, not our core business	yes	yes, details are in Comments column			
	High-level agreed standards	no					
	Monitoring requirements	no					

LEGMC

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core b	yes	no	no	no	
	Drilling technologies	no	no	no	no	no	
	Completion	no	no	no	no	no	
	Leak detection	no	no	no	no	no	
	Fracturing technologies	no	no	no	no	no	
	Best practices	no	yes	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	no	no	no	no	
	Monitoring	no	no	no	no	no	
Capacity assessement	Methodological standards	no	yes	no	no	no	
	Matched capacity	no	yes	no	no	no	
	Storage atlas	partially, not our core b	yes	no	no	no	
	Saline aquifers	partially, not our core b	yes	no	no	no	
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	no	no	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	no	no	no	no	
	Operational integrated systems	no	no	no	no	no	
	Multi-sources and sinks systems	no	no	no	no	no	
	Combined uses	no	no	no	no	no	
	Cross-border schemes	no	no	no	no	no	
	conflicts	no	no	no	no	no	
Complex management	Fluid management	no	no	no	no	no	
	Pressure management	no	no	no	no	no	
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	no	no	no	no	no	
	Mineralization favouring	no	no	no	no	no	
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	no	no	no	no	
	Safety standards	no	no	no	no	no	
Environmental impact	CO2 impacts	no	no	no	no	no	
	Remote sensing techniques	no	no	no	no	no	
	Experimental sites	no	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	no	yes	no	no	no	
	Sensitivity analysis	no	yes	no	no	no	
	Guidance documents	no	no	no	no	no	
	Upscaling methodologies	no	no	no	no	no	
	Heterogeneities	no	no	no	no	no	
	Effects of impurities	no	no	no	no	no	
	Experiments	no	yes	no	no	no	
Monitoring	Leakage detections	no	yes	no	no	no	
	Leakage quantifications	no	yes	no	no	no	
	Non intrusive methods	no	no	no	no	no	
	High-level agreed standards	no	no	no	no	no	
	Monitoring requirements	no	yes	no	no	no	

LNEG

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	no					
	Drilling technologies	no					
	Completion	no					
	Leak detection	no					
	Fracturing technologies	no					
	Best practices	no					
	Well repairing	no					
	Leak characterization	no					
	Monitoring	no					
Capacity assessement	Methodological standards	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Matched capacity	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Storage atlas	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Saline aquifers	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
Mitigation and remediation	Rapid remediation	no					
	Mantainance and restoring of seals	no					
	Excessive pressure alleviation	no					
	Effects on environment	no					
	Dverting CO2 from pathways	no					
Land planning and infrastructure	Network infrastructures	partially, not our core business	yes	no	don't know	don't know	
	Operational integrated systems	partially, not our core business	yes	no	don't know	don't know	
	Multi-sources and sinks systems	yes, our core business	yes	no	don't know	don't know	
	Combined uses	partially, not our core business	yes	no	don't know	don't know	
	Cross-border schemes	yes, our core business	yes	no	don't know	don't know	
	conflicts	no	don't know	no	don't know	don't know	
Complex management	Fluid management	no					
	Pressure management	no					
	Injectivity guidelines	no					
	Dissolution favouring	no					
	Mineralization favouring	no					
	Deep biological activity	no					
	Several streams injection	no					
	Efficiency standards	no					
	Safety standards	no					
Environmental impact	CO2 impacts	no	yes				
	Remote sensing techniques	no	yes				
	Experimental sites	no	yes				
Modelling	Flow, geomechanical and geochemical models	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Sensitivity analysis	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Guidance documents	no	yes				
	Upscaling methodologies	no	yes				
	Heterogeneities	no	yes				
	Effects of impurities	no	yes				
	Experiments	no	yes				
Monitoring	Leakage detections	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Leakage quantifications	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Non intrusive methods	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	High-level agreed standards	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP
	Monitoring requirements	partially, not our core business	yes	no	yes, details are in Comments column	yes, details are in Comments column	Intention of lauching Spearhead project, announced to ZEP

METU-PAL

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration						
	Drilling technologies						
	Completion						
	Leak detection						
	Fracturing technologies						
	Best practices						
	Well repairing						
	Leak characterization						
	Monitoring						
Capacity assessement	Methodological standards	yes, our core business	yes				
	Matched capacity	yes, our core business	yes				
	Storage atlas	yes, our core business	yes				
	Saline aquifers	yes, our core business	yes				
Mitigation and remediation	Rapid remediation	yes, our core business	yes				
	Mantainance and restoring of seals	yes, our core business	yes				
	Excessive pressure alleviation	yes, our core business	yes				
	Effects on environment	partially, not our core b	yes				
	Diverting CO2 from pathways	yes, our core business	yes				
Land planning and infrastructure	Network infrastructures						
	Operational integrated systems						
	Multi-sources and sinks systems						
	Combined uses						
	Cross-border schemes						
	conflicts						
Complex management	Fluid management	yes, our core business	yes				
	Pressure management	yes, our core business	yes				
	Injectivity guidelines	yes, our core business	yes				
	Dissolution favouring	yes, our core business	yes				
	Mineralization favouring	yes, our core business	yes				
	Deep biological activity	partially, not our core b	yes				
	Several streams injection	yes, our core business	yes				
	Efficiency standards	partially, not our core business					
	Safety standards	partially, not our core business					
Environmental impact	CO2 impacts	partially, not our core business					
	Remote sensing techniques	partially, not our core business					
	Experimental sites						
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes				
	Sensitivity analysis	yes, our core business	yes				
	Guidance documents	yes, our core business	yes				
	Upscaling methodologies	yes, our core business	yes				
	Heterogeneities	yes, our core business	yes				
	Effects of impurities	yes, our core business	yes				
	Experiments	yes, our core business	yes				
Monitoring	Leakage detections	partially, not our core business					
	Leakage quantifications	partially, not our core business					
	Non intrusive methods						
	High-level agreed standards						
	Monitoring requirements	partially, not our core business					
CO2 for EOR	Lab experiments	yes, our core business	yes	Our research program is in this area		Sometimes, if the field study is requested from an oil company	
	Modelling	yes, our core business	yes	Our research program is in this area			
Cap rock and well integrity	Lab experiments	yes, our core business	yes	Our research program is in this area			
	Modelling	yes, our core business	yes	Our research program is in this area			

OGS

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	yes	no	don't know	no	
	Drilling technologies	no		no	don't know	no	
	Completion	no		no	don't know	no	
	Leak detection	partially, not our core business	yes	no	don't know	no	
	Fracturing technologies	no		no	don't know	no	
	Best practices	no		no	don't know	no	
	Well repairing	no		no	don't know	no	
	Leak characterization	no		no	don't know	no	
	Monitoring	no		no	don't know	no	
Capacity assessement	Methodological standards	partially, not our core business	yes	no	don't know	no	
	Matched capacity	partially, not our core business	yes	no	don't know	no	
	Storage atlas	yes, our core business	yes	no	don't know	no	
	Saline aquifers	yes, our core business	yes	no	don't know	yes, details are in Comments column	private funds from ENEL
Mitigation and remediation	Rapid remediation	no		no	don't know	no	
	Mantainance and restoring of seals	no		no	don't know	no	
	Excessive pressure alleviation	no		no	don't know	no	
	Effects on environment	yes, our core business	yes	no	don't know	no	
	Dverting CO2 from pathways	no		no	don't know	no	
Land planning and infrastructure	Network infrastructures	no		no	don't know	no	
	Operational integrated systems	no		no	don't know	no	
	Multi-sources and sinks systems	no		no	don't know	no	
	Combined uses	no		no	don't know	no	
	Cross-border schemes	no		no	don't know	no	
	conflicts	no		no	don't know	no	
Complex management	Fluid management	no		no	don't know	no	
	Pressure management	no		no	don't know	no	
	Injectivity guidelines	no		no	don't know	no	
	Dissolution favouring	no		no	don't know	no	
	Mineralization favouring	no		no	don't know	no	
	Deep biological activity	no		no	don't know	no	
	Several streams injection	no		no	don't know	no	
	Efficiency standards	no		no	don't know	no	
	Safety standards	no		no	don't know	no	
Environmental impact	CO2 impacts	yes, our core business	yes	no	don't know	yes, details are in Comments column	private funds from ENEL
	Remote sensing techniques	yes, our core business	yes	no	don't know	no	
	Experimental sites	yes, our core business	yes	no	don't know	no	
Modelling	Flow, geomechanical and geochemical models	no		no	don't know	no	
	Sensitivity analysis	yes, our core business	yes	no	don't know	yes, details are in Comments column	private funds from ENEL
	Guidance documents	partially, not our core business	yes	no	don't know	no	
	Upscaling methodologies	no		no	don't know	no	
	Heterogeneities	no		no	don't know	no	
	Effects of impurities	no		no	don't know	no	
	Experiments	yes, our core business	yes	no	don't know	no	
Monitoring	Leakage detections	yes, our core business	yes	no	don't know	no	
	Leakage quantifications	no		no	don't know	no	
	Non intrusive methods	yes, our core business	yes	no	don't know	no	
	High-level agreed standards	no		no	don't know	no	
	Monitoring requirements	yes, our core business	yes	no	don't know	yes, details are in Comments column	private funds from ENEL

PGI

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	yes	no	no	yes, details are in Comments column	PGE CCS demo project (EEPR)
	Drilling technologies	no	no	no	no	yes, details are in Comments column	PGE CCS demo project (EEPR)
	Completion	no	no	no	no	yes, details are in Comments column	PGE CCS demo project (EEPR)
	Leak detection	no	no	no	no	yes, details are in Comments column	PGE CCS demo project (EEPR)
	Fracturing technologies	no	no	no	no	yes, details are in Comments column	PGE CCS demo project (EEPR)
	Best practices	partially, not our core business	yes	no	no	yes, details are in Comments column	PGE CCS demo project (EEPR)
	Well repairing	no	no	no	no	no	
	Leak characterization	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection (mostly private, some public funding - contracts being signed)
	Monitoring	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
Capacity assessement	Methodological standards	yes, our core business	yes	yes, details are in Comments column		no	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans
	Matched capacity	yes, our core business	yes	yes, details are in Comments column		no	(2008-2012) - based on archive geoscience data
	Storage atlas	yes, our core business	yes	yes, details are in Comments column		no	
	Saline aquifers	yes, our core business	yes	yes, details are in Comments column		yes, details are in Comments column	PGE CCS demo project (EEPR)
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	no	no	no	no	
	Operational integrated systems	no	no	no	no	no	
	Multi-sources and sinks systems	partially, not our core business	yes	yes, details are in Comments column	no	yes, details are in Comments column	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans/PGE CCS demo project (EEPR)
	Combined uses	no	no	no	no	no	
	Cross-border schemes	partially, not our core business	yes	yes, details are in Comments column	no	no	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans
	conflicts	partially, not our core business	yes	yes, details are in Comments column	no	yes, details are in Comments column	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans/PGE CCS demo project (EEPR)
Complex management	Fluid management	partially, not our core business	yes	yes, details are in Comments column	no	no	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans
	Pressure management	partially, not our core business	yes	no	no	no	
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	no	no	no	no	no	
	Mineralization favouring	no	no	no	no	no	
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	no	no	no	no	
	Safety standards	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	no	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans
Environmental impact	CO2 impacts	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans/PGE CCS demo project (EEPR)
	Remote sensing techniques	partially, not our core business	yes	no	no	yes, details are in Comments column	PGE CCS demo project (EEPR)
	Experimental sites	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
Modelling	Flow, geomechanical and geochemical models	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans/PGE CCS demo project (EEPR)
	Sensitivity analysis	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans/PGE CCS demo project (EEPR)
	Guidance documents	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans/PGE CCS demo project (EEPR)
	Upscaling methodologies	no	no	no	no	no	
	Heterogeneities	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	Assessment of formations and structures suitable for CO2 geological storage including monitoring plans/PGE CCS demo project (EEPR)
	Effects of impurities	no	no	no	no	no	
	Experiments	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
Monitoring	Leakage detections	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
	Leakage quantifications	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
	Non intrusive methods	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
	High-level agreed standards	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection
	Monitoring requirements	yes, our core business	yes	yes, details are in Comments column	yes, details are in Com	yes, details are in Comments column	pilot injection

RBINS-GSB

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	no	no	no	no	no	
	Drilling technologies	no	no	no	no	no	
	Completion	no	no	no	no	no	
	Leak detection	no	no	no	no	no	
	Fracturing technologies	no	yes	no	no	no	Coal sequence storage
	Best practices	no	no	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	no	no	no	no	
	Monitoring	no	no	no	no	no	
Capacity assessement	Methodological standards	yes, our core business	yes	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Matched capacity	yes, our core business	yes	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Storage atlas	yes, our core business	yes	yes, details are in Comm	no	no	
	Saline aquifers	yes, our core business	yes	yes, details are in Comm	no	no	
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	no	no	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	yes, our core business	yes	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Operational integrated systems	yes, our core business	yes	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Multi-sources and sinks systems	yes, our core business	yes	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Combined uses	partially, not our core b	no	no	no	no	
	Cross-border schemes	yes, our core business	yes	yes, details are in Comm	no	don't know	PSS-CCS projects (nationally funded), interest for future research
	conflicts	partially, not our core b	yes	no	no	no	
Complex management	Fluid management	no	no	no	no	no	
	Pressure management	yes, our core business	yes	no	no	no	For specific reservoirs (coal mines and surrounding settings)
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	no	no	no	no	no	
	Mineralization favouring	no	no	no	no	no	
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	no	no	no	no	
	Safety standards	no	no	no	no	no	
Environmental impact	CO2 impacts	no	no	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Remote sensing techniques	no	no	no	no	no	
	Experimental sites	no	no	no	no	no	
Modelling	Flow, geomechanical and geochemical models	no	no	no	no	no	
	Sensitivity analysis	no	no	no	no	no	
	Guidance documents	yes, our core business	yes	no	no	no	I'm not sure what is meant by guidance documents: yes if these are the EC guidance documents, no if these are technical and model specific documents.
	Upscaling methodologies	no	no	no	no	no	
	Heterogeneities	no	no	no	no	no	
	Effects of impurities	no	no	no	no	no	
	Experiments	no	no	no	no	no	
Monitoring	Leakage detections	no	no	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Leakage quantifications	no	no	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Non intrusive methods	yes, our core business	yes	yes, details are in Comm	no	no	PS-InSAR techniques
	High-level agreed standards	no	no	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)
	Monitoring requirements	no	no	yes, details are in Comm	no	no	PSS-CCS projects (nationally funded)

SGUDS

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	National project is running, next projects are prepared
	Drilling technologies	no	yes	no	no	no	
	Completion	no	yes	no	no	no	
	Leak detection	no	yes	no	no	no	
	Fracturing technologies	no	no	no	no	no	
	Best practices	no	yes	no	no	no	
	Well repairing	no	no	no	no	no	
	Leak characterization	no	yes	no	no	no	
	Monitoring	no	yes	no	no	no	
Capacity assessement	Methodological standards	no	yes	no	no	no	
	Matched capacity	no	yes	no	no	no	
	Storage atlas	partially, not our core business	yes	yes, details are in Comments column	no	no	National project is running, next projects are prepared
	Saline aquifers	partially, not our core business	yes	yes, details are in Comments column	no	no	National project is running, next projects are prepared
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	yes	no	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	don't know	no	no	no	
	Operational integrated systems	no	don't know	no	no	no	
	Multi-sources and sinks systems	no	don't know	no	no	no	
	Combined uses	no	don't know	no	no	no	
	Cross-border schemes	no	yes	no	no	no	
	conflicts	no	don't know	no	no	no	
Complex management	Fluid management	no	don't know	no	no	no	
	Pressure management	no	don't know	no	no	no	
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	partially, not our core business	yes	no	no	no	
	Mineralization favouring	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	National project is running, next projects are prepared
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	yes	no	no	no	
	Safety standards	no	yes	no	no	no	
Environmental impact	CO2 impacts	no	yes	no	no	no	
	Remote sensing techniques	no	yes	no	no	no	
	Experimental sites	no	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	partially, not our core business	yes	no	no	no	National project is running, next projects are prepared
	Sensitivity analysis	no	don't know	no	no	no	
	Guidance documents	partially, not our core business	yes	no	no	no	National project is running, next projects are prepared
	Upscaling methodologies	no	don't know	no	no	no	
	Heterogeneities	no	don't know	no	no	no	
	Effects of impurities	no	no	no	no	no	
	Experiments	no	yes	no	no	no	
Monitoring	Leakage detections	no	yes	no	no	no	
	Leakage quantifications	no	yes	no	no	no	
	Non intrusive methods	no	yes	no	no	no	
	High-level agreed standards	no	no	no	no	no	
	Monitoring requirements	no	don't know	no	no	no	

SWEDEN

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	No	yes, details are in Comments column	don't know	don't know	don't know	
	Drilling technologies	no	don't know	don't know	don't know	don't know	
	Completion	no	don't know	don't know	don't know	don't know	
	Leak detection	no	don't know	don't know	don't know	don't know	
	Fracturing technologies	no	don't know	don't know	don't know	don't know	
	Best practices	no	don't know	don't know	don't know	don't know	
	Well repairing	no	don't know	don't know	don't know	don't know	
	Leak characterization	no	don't know	don't know	don't know	don't know	
	Monitoring	partially, not our core business	don't know	don't know	don't know	don't know	
Capacity assessement	Methodological standards	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Matched capacity	partially, not our core business	don't know	don't know	don't know	don't know	
	Storage atlas	no	don't know	don't know	don't know	don't know	
	Saline aquifers	partially, not our core business	don't know	don't know	don't know	don't know	
Mitigation and remediation	Rapid remediation	no	don't know	don't know	don't know	don't know	
	Mantainance and restoring of seals	no	don't know	don't know	don't know	don't know	
	Excessive pressure alleviation	no	don't know	don't know	don't know	don't know	
	Effects on environment	no	don't know	don't know	don't know	don't know	
	Dverting CO2 from pathways	no	don't know	don't know	don't know	don't know	
Land planning and infrastructure	Network infrastructures	no	don't know	don't know	don't know	don't know	
	Operational integrated systems	no	don't know	don't know	don't know	don't know	
	Multi-sources and sinks systems	no	don't know	don't know	don't know	don't know	
	Combined uses	no	don't know	don't know	don't know	don't know	
	Cross-border schemes	no	don't know	don't know	don't know	don't know	
	conflicts	no	don't know	don't know	don't know	don't know	
Complex management	Fluid management	no	don't know	don't know	don't know	don't know	
	Pressure management	no	don't know	don't know	don't know	don't know	
	Injectivity guidelines	no	don't know	don't know	don't know	don't know	
	Dissolution favouring	no	don't know	don't know	don't know	don't know	
	Mineralization favouring	no	don't know	don't know	don't know	don't know	
	Deep biological activity	no	don't know	don't know	don't know	don't know	
	Several streams injection	no	don't know	don't know	don't know	don't know	
	Efficiency standards	no	don't know	don't know	don't know	don't know	
	Safety standards	no	don't know	don't know	don't know	don't know	
Environmental impact	CO2 impacts	no	yes, details are in Comments column	don't know	don't know	don't know	
	Remote sensing techniques	no	yes, details are in Comments column	don't know	don't know	don't know	
	Experimental sites	no	yes, details are in Comments column	don't know	don't know	don't know	
Modelling	Flow, geomechanical and geochemical models	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Sensitivity analysis	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Guidance documents	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Upscaling methodologies	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Heterogeneities	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Effects of impurities	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Experiments	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
Monitoring	Leakage detections	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	
	Leakage quantifications	no	yes, details are in Comments column	don't know	don't know	don't know	
	Non intrusive methods	no	yes, details are in Comments column	don't know	don't know	don't know	
	High-level agreed standards	no	yes, details are in Comments column	don't know	don't know	don't know	
	Monitoring requirements	partially, not our core business	yes, details are in Comments column	don't know	don't know	don't know	

TNO

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	no	no	no		
	Drilling technologies	partially, not our core business	don't know	no	no		
	Completion	partially, not our core business	don't know	no	no		
	Leak detection	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		
	Fracturing technologies	yes, our core business	don't know	don't know	don't know		
	Best practices	partially, not our core business	yes	no	no		
	Well repairing	no	don't know	no	no		
	Leak characterization	yes, our core business	yes	no	no		
	Monitoring	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column		
Capacity assessement	Methodological standards	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		EU Geocapacity
	Matched capacity	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		EU Geocapacity
	Storage atlas	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		EU Geocapacity
	Saline aquifers	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		EU Geocapacity
Mitigation and remediation	Rapid remediation	partially, not our core business	yes	no	no		
	Mantainance and restoring of seals	partially, not our core business	yes	don't know	don't know		
	Excessive pressure alleviation	yes, our core business	yes	don't know	don't know		
	Effects on environment	partially, not our core business	don't know	don't know	don't know		
	Dverting CO2 from pathways	yes, our core business	don't know	don't know	don't know		
Land planning and infrastructure	Network infrastructures	partially, not our core business	don't know	no	no		
	Operational integrated systems	partially, not our core business		no	no		
	Multi-sources and sinks systems	partially, not our core business	don't know	no	no		
	Combined uses	yes, our core business	yes	no	no		
	Cross-border schemes	partially, not our core business	don't know	no	no		
	conflicts	partially, not our core business	don't know	no	no		
Complex management	Fluid management	yes, our core business	yes	don't know	don't know		
	Pressure management	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		
	Injectivity guidelines	yes, our core business	don't know	yes, details are in Comments column	yes, details are in Comments column		
	Dissolution favouring	yes, our core business	yes	don't know	don't know		
	Mineralization favouring	yes, our core business	don't know	don't know	don't know		
	Deep biological activity	partially, not our core business	don't know	no	no		
	Several streams injection	partially, not our core business	no	no	no		
	Efficiency standards	partially, not our core business	don't know	no	no		
	Safety standards	partially, not our core business	don't know	yes, details are in Comments column	yes, details are in Comments column		
Environmental impact	CO2 impacts	partially, not our core business	don't know	don't know	don't know		
	Remote sensing techniques	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Experimental sites	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
Modelling	Flow, geomechanical and geochemical models	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Sensitivity analysis	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Guidance documents	yes, our core business		yes, details are in Comments column	yes, details are in Comments column		CATO2
	Upscaling methodologies	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Heterogeneities	yes, our core business	don't know	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Effects of impurities	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Experiments	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
Monitoring	Leakage detections	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Leakage quantifications	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Non intrusive methods	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	High-level agreed standards	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2
	Monitoring requirements	yes, our core business	yes	yes, details are in Comments column	yes, details are in Comments column		CATO2

TTUGI

Related Technology	Research Area	Is it part of your institution's R&D activities?	Do you wish to cooperate with CGS Europe partners in this area?	Is there currently a national programme for research in this area?	Is there a national programme for future research in this area?	Is there private funding for this research area?	Comments
Wells	Exploration	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column		We study drill cores from old boreholes in Estonia and Latvia
	Drilling technologies	no	no	No	No	no	We have private drilling companies in Estonia.
	Completion	partially, not our core business	no	no	no	no	
	Leak detection	partially, not our core business	no	no	no	no	
	Fracturing technologies	no	no	no	no	no	
	Best practices	no	no	no	no	no	
	Well repairing	partially, not our core business	No	no	no	don't know	
	Leak characterization	partially, not our core business	no	no	no	no	
	Monitoring	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	Monitoring of water wells are ongoing in Estonia by national and private companies
Capacity assessement	Methodological standards	partially, not our core business	yes	yes, details are in Comments column	no	no	We are ready to cooperate on this issue with any country, as we made research on this issue on the Baltic Region (9 countries) and published article.
	Matched capacity	partially, not our core business	yes	yes, details are in Comments column	no	no	We are working with capacity in the Baltic Region
	Storage atlas	partially, not our core business	yes	yes, details are in Comments column	no	no	We would like to take part in Storage atlas project
	Saline aquifers	partially, not our core business	yes	yes, details are in Comments column	no	no	We would like to cooperate with our neigbours (Latvia and Russia) on saline aquifers capacity
Mitigation and remediation	Rapid remediation	no	no	no	no	no	
	Mantainance and restoring of seals	no	no	no	no	no	
	Excessive pressure alleviation	no	no	no	no	no	
	Effects on environment	no	yes	no	no	no	
	Dverting CO2 from pathways	no	no	no	no	no	
Land planning and infrastructure	Network infrastructures	no	yes		no	no	
	Operational integrated systems	partially, not our core business	yes		no	no	
	Multi-sources and sinks systems	partially, not our core business	yes		no	no	
	Combined uses	no	yes		no	no	
	Cross-border schemes	partially, not our core business	yes	yes, details are in Comments column	no	no	Economic modelling of cross-border scenario we made in EU Geocapacity project and published article.
	conflicts	partially, not our core business	yes	no	no	no	
Complex management	Fluid management	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column		TTU Mining Institute has got State license for hydrogeological research, mapping and hydrogeological drilling projects
	Pressure management	no	yes	no	no	no	
	Injectivity guidelines	no	no	no	no	no	
	Dissolution favouring	no	yes	no	no	no	
	Mineralization favouring	partially, not our core business	yes	no	no	no	
	Deep biological activity	no	no	no	no	no	
	Several streams injection	no	no	no	no	no	
	Efficiency standards	no	yes	no	no	no	
	Safety standards	no	yes	no	no	no	
Environmental impact	CO2 impacts	no	yes	no	no	no	
	Remote sensing techniques	no	yes	no	no	no	
	Experimental sites	no	yes	no	no	no	
Modelling	Flow, geomechanical and geochemical models	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	no	Geochemical models which are not connected with CO2 are under research
	Sensitivity analysis	no	yes	no	no	no	
	Guidance documents	no	no	no	no	no	
	Upscaling methodologies	no	yes	no	no	no	
	Heterogeneities	no	yes	no	no	no	
	Effects of impurities	no	yes	no	no	no	
	Experiments	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column	yes, details are in Comments column	There is research on water, but not on CO2 storage. Experiments are made on oil shale ash and waste water with CO We have planned CO2-rock interaction experiments, but did not receive money for laboratory equipment.
Monitoring	Leakage detections	no	no	no	no	no	
	Leakage quantifications	no	no	no	no	no	
	Non intrusive methods	partially, not our core business	yes	yes, details are in Comments column	yes, details are in Comments column		Some geophysical techniques are available in Tartu University and Geological Center. They are not applied for CO2 monitoring
	High-level agreed standards	no	no	no	no	no	
	Monitoring requirements	no	yes	no	no	no	

ANNEX II

ABSTRACT PRESENTED TO GHGT-11 CONGRESS

CCS Directive transposition into national laws in Europe: progress and problems by the end of 2011

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Directive 2009/31/EC (CCS Directive) of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide entered into force on 25 June 2009 and established a legal framework for the environmentally safe geological storage of carbon dioxide to mitigate climate change. The deadline for member states to bring into force the laws, regulations and administrative provisions was 25 June 2011, and the storage sites have to operate in accordance with this Directive by 25 June 2012.

The CCS Directive transposition process and related problems in 26 European countries, including 24 EU member states, Norway and Croatia were monitored in the EU FP7 project CGS Europe in 2011. The aims of the research were to analyse results of the transposition of the CCS Directive into national law by the end of 2011, to compare the situation in the studied countries after the deadline, and to identify common and specific problems. During this study we had to take into account different geological, political and financial situations, climate and energy strategies, varying levels of research and technological development, and differences in public awareness and acceptance of CCS. The results of the study clarify the drivers and barriers to transposition, and prospects for implementation of CCS in Europe.

By the end 2011 the transposition of the Directive into national law was approved by the European Commission (EC) for Spain only, but was ready at national/ jurisdictional level in 12 more countries (Austria, Denmark, Estonia, France, Ireland, Italy, Latvia, Lithuania, Romania, Slovakia, Sweden and The Netherlands) and two regions of Belgium. Italy, France, Romania, Spain and The Netherlands permitted CO_2 storage (except for seismic areas in Italy) and support demonstration projects in their national climate and energy strategy. Lithuania, Slovakia and part of

Belgium permitted CO_2 storage, but they have unclear prospects for CO_2 storage projects. Denmark permitted only offshore storage until 2020. Sweden temporarily forbids storage, but continues in 2012 to work on a law permitting offshore storage. Austria, Estonia, Ireland and Latvia prohibited CO_2 storage in their territories. Among them Austria has insufficient CO_2 storage capacity and Estonia has none. Other EU States, part of Belgium, Norway and Croatia postponed the final transposition to 2012. Norway, Germany, Poland and UK, countries with sufficient storage capacity and either operating or planned demonstration projects, did not finish the Directive transposition process in 2011 due to complications by on-going political debates, public opposition (Germany), ministerial elections (Poland), and distribution of legislative power between central and devolved governments (UK).

In 2011, there were a total of 20 operating, developing and planned CCS pilot and demonstration projects, including capture and full chain CCS, in nine European countries (Italy, France, Germany, Norway, The Netherlands, Poland, Romania, Spain and UK). Unfavourable results of the CCS Directive transposition in Denmark and delays in Germany have since led to abandonment of two onshore projects planned by Vattenfall in these countries.

A summary of some of the main findings of our study:

1. Many of the studied countries made significant progress towards implementation of CCS technology through a national climate and energy strategy, research, transposition of the CCS Directive into national law and development of pilot and demonstration projects. However, the transposition process met various barriers and problems in a number of European States and was challenged by the on-going economic crisis.
2. By the end of 2011 the transposition of the CCS Directive into national law was complete at EC level only in Spain, but completed at national level also in 12 more countries and two regions of Belgium. Ten other EU Member States (Bulgaria, Czech Republic, Finland, Germany, Greece, Hungary, Poland, Portugal, Slovenia and UK), Norway, Croatia and two regions of Belgium postponed the final transposition to 2012.
3. The countries with the most advanced level of CCS research and technology, CCS plans included in the energy and climate strategies, supported pilot and demo projects (Germany, UK, Norway, France, The Netherlands and Italy) did not use their advantages to finish CCS transposition before the EC deadline. Among these countries only Italy, France and The Netherlands managed to finish transposition at national level in 2011, while UK, Germany and Norway postponed it to 2012. Nevertheless the situation in UK regarding implementation of CCS is one of the most promising in Europe, considering the published in December 2011 decision on governmental financial support of one billion pounds for demonstration projects. The situation in Germany, where two versions of CCS Bill have been rejected in 2010 and 2011, seems to be the most problematic.
4. The high influence of Green parties and NGOs, and their ability to involve the public in debates negatively influenced the transposition process in Germany, and led to a ban on onshore storage in Denmark until 2020, and abandonment of the plans for onshore demonstration projects in Denmark (Nordjylland Coal Power Station) and Germany (Jänschwalde Lignite Power Station).
5. In the studied countries CO_2 storage capacity was estimated as sufficient in 17 countries, insufficient in 6 countries, and no capacity was found in two countries (Estonia and Finland). No estimations are available for Sweden.
6. Only ten of the studied states permitted/will permit CO_2 storage for the whole territory, while three countries (Denmark until 2020, Norway and Sweden) permit/will permit only offshore storage. Seven countries prohibited or are planning to prohibit CO_2 storage permanently in their territory, except for research (Estonia, Latvia, Ireland and Finland), or temporarily (Poland, Czech Republic and Sweden). Italy and Belgium do not permit storage in selected areas.
7. Several countries took measures to prohibit CO_2 storage temporarily in order to wait with large scale deployment of CO_2 storage technology in their territories (Austria and Czech Republic),

or by limiting the amount of permitted for storage CO_2 (Bulgaria), and to see the results of the demonstration projects (Poland).

8. The readiness of the CCS Directive transposition into national laws depends on different national conditions and problems, but does not directly correlate with national policy, financial situation or storage capacity.