European Commission
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ENeRG public consultation on CCS by the Commission

In response to the questions set out on 27 March 2013, the European Commission launched a Consultative Communication on "The future of Carbon Capture and Storage (CCS) in Europe", with the aim of initiating a debate on the options available to ensure its timely development, I am sending you this brief set of recommendations as president of ENeRG.

ENeRG - (European Network for Research in Geo-Energy) is an informal contact network open to all European organisations that have a primary mission and objective to conduct basic and applied research and technological activities related to the exploration and production of energy sources derived from the Earth's crust.

To fight global warming, many countries are looking at technological solutions to keep the release of CO_2 in the atmosphere under control. One of the most promising technologies is CO_2 capture and storage (CCS) also called CO_2 geological storage.

CCS usually involves a series of steps:

- Separating the CO_2 from the gases produced by large power plants or other point sources.
- Compressing the CO_2 into supercritical (liquid) form.
- Transporting it to a given location.
- Injecting it into deep underground geological formations.

The science and technology behind CCS is already manifested and has been in use for enhanced oil recovery (EOR) since the 1960'ties and for CO_2 geological storage since 1996. Further development of CCS is needed if CCS shall be implemented on a large scale. A number of CCS demonstration projects are now at various stages of development in Europe and other parts of the world. However many projects have also failed due to lack of financing, public acceptance, timing of all involved activities, etc.

CO_2 capture and storage CCS is one of the most promising technologies to address the issue of excessive anthropogenic CO_2 emissions in the atmosphere. For CCS, the saline aquifers are considered very attractive for CO_2 storage compared to other options because of their huge storage capacity in Europe and other parts of the world.

However, in order to fully exploit these potential several objectives need to be addressed and investigated.

- Better timing of the capture, transport and storage processes
- Public acceptance
- Analyse the learning process
- Funding possibilities and problems
- Keep 'Climate Change' in the picture

CO_2 capture

During the last two decades, major research activities were invested in CCS. Capture processes and plants have established. The capture process is ready, although more research is off cause needed to improve and optimize the processes and energy efficiency. Capturing CO_2 emissions from various point sources and storing it underground is a crucial technology to reduce CO_2 that would otherwise accumulate in the atmosphere causing accelerated and lethal global warming. The capture R&D has been concentrated on coal-fired power plants. It is time to establish capture from other sources like cement or steel industry. Capturing from sources, that you cannot avoid, will most likely make CCS much more accepted in the public opinion.

- CCS is not just for coal

CO_2 transport: accelerate the development of a CO_2 infrastructure

CO_2 transport is a well-known technology, with many years of experience not at least in USA where is has been connected to enhanced oil recovery (EOR), but Europe has not developed a network for CO_2 transport.

In FP7, CO_2 transport projects focused on the various aspects of transport infrastructures needed to enable the large-scale deployment of CCS in the EU, as well as a techno-economic assessment of the impact of impurities in CO_2, fluid properties, phase behaviour and chemical reactions in pipelines. Actions in the field of CO_2 transport should focus setting up a transport infrastructure, including opportunities for creating CO_2 source clusters, combining on- and offshore transport, and transporting CO_2 in populated areas.

Forming a CO_2 infrastructure is creating a basic physical and organizational structure needed for the operation of CO_2 transport for the society and enterprises. It is important to define and understand the public (EU and MS' governments) role in establishing a CO_2 infrastructure so CO_2 is available when needed for e.g. EOR or to transport CO_2 from where it is captured to a storage site. The infrastructure must be in place in advance, EU agreement collaboration has to be part of the solution and MS are responsible for the implementation, but not necessary for the financing. Investments in an infrastructure will improve the timing for making CCS happen.

- CO2 transport: accelerate the development of a CO_2 infrastructure

Geological storage of CO_2

Capturing CO_2 emissions from various point sources and storing it underground is a crucial technology to reduce CO_2 that would otherwise accumulate in the atmosphere causing accelerated and lethal global warming. The technology is necessary to reducing the global warming impact of

fossil fuels such as coal and hydrocarbons, on which the world will continue to depend on for decades.

EU aims to promote the construction and operation of a number of CCS demonstration projects. For stimulating the role that CCS can play in a portfolio of greenhouse gas mitigation options, ENeRG believes that we will need knowledge on how much CO_2 storage capacity, there can be relied on, where this storage capacity is and when will it be available.

Storage Atlas

Most of the EU member states and associate countries participated in the EU GeoCapacity project and even more countries were involved in the CO2StoP project. The European Commission has started the CO2StoP project to establish a database on public available data on CO_2 storage potential in Europe. The CO2StoP project is building upon the basic work and results generated by the previous projects, the EU GeoCapacity FP6 R&D project (started 2006 and ended 2008) which again was based upon the results of the Joule II project (finalised 1993), the GESTCO project (finalised 2003), and the Castor project (finalised 2006). ENeRG considers the CO2StoP project as a very important and that it needs to be further developed.

In addition to making member states aware of the importance of exploring and understanding their underground territory for large-scale deployment of CCS, a CO_2 storage atlas is needed at European scale. This has been realised in other continents, and means for Europe a continuation and scaling up of earlier projects (Joule II. GESTCO, Castor, EU GeoCapacity, CO2StoP). The storage atlas will be essential for European policymakers and stakeholders to answer the questions on how much, at which cost, where and when CO_2 can be stored. Development of CO_2 geological storage is a critical point in large deployment of CCS. The primary purpose of a European Atlas is to provide updated information on the CO_2 storage potential for the European planning of storage activities and the locations and storage potential of various geological storage sites. A key aspect of a European CCS Atlas will be the availability of the most current and best available estimates of potential CO_2 storage resource determined by a methodology applied consistently across all of Europe, Canada, USA and Australia.

ENeRG consider that a proper published CO_2 storage atlas is needed for Europe. In addition to the published atlas, an interactive web atlas is needed for combining information on large CO_2 point sources, CO_2 transport infrastructure and CO_2 storage capacity. ENeRG suggests combining it to the OneGeology-Europe database and linking it to the individual countries databases for CO_2 storage data[1]. An ideal interactive web atlas would not only include data, but also the analysis of data, which could be provided through OneGeology-Europe. The technical question of consolidation from national data servers has been addressed in the EuroGeoSource project.

Geologic CO_2 storage involves also the separation and capture of CO_2 at the point of emissions and the transportation of CO_2, and these data should preferably be in the database as they were in the EU GeoCapacity project.

[1] These data services can of course also be used for other portals, e.g. geothermal data, which will be using many of same data as for CO_2 geological storage, borehole porosity, permeability, temperature etc.

Analyse the learning process

Since 2007, when EU called for up to 12 CCS projects to be running by 2015 situations today have changed dramatically. The ambition to launch a pioneering demonstration programme that would meet the EU's climate goals, has failed. Commercial scale CCS technology has still to be developed. EU must learn the lessons of the failure of these planned projects if further time shall not be lost before large demo projects start. EU must learn key lessons from the failed attempts to design, construct and operate commercial-scale CCS projects.

The availability of CO_2, a transport infrastructure, underground storage formations and a funding seems to have failed being present at the same time for the deployment of CCS in Europe. The gap between funding for and cost of CCS demo projects were highlighted during the NER300 call. This is one of the main reasons for the failure of many NER300 projects. We must learn the lessons from the CCS projects failure; we need an R&D action to describe what went wrong:

- Timing of capture, transport, and storage
- Regulatory plans or funding
- Public and political awareness, support or resistance

A key outcome must be better facilitation of future of CCS project implementation.

Funding possibilities and problems

Industry has already demonstrated its willingness to take on a major portion of the costs and risks of investing in CCS technology. However, establishing large demo projects need a more flexible funding scheme than the NER300 scheme with fixed application deadlines. All the projects before and under Phase I of NER300 were moving ahead at different speed. Establishing capture facilities, transport and storage of CO_2 in different regions of Europe cannot happen "on stroke." Large project like demo projects will in all probability be "out of step."

Even though the CCS is a proven technology, it will need different development plans when it is scaled up to large integrated projects. There will be significant differences from region to region or project to project.

No CCS demo- project was awarded funding in Phase I of the NER300 scheme because governments were not able to confirm the level of co-funding they would provide on time. However, it seems that this was the result of differences in timing: funding commitments can only be made following detailed negotiation between the different stakeholders involved and this takes time. It is clear that viable projects are still being progressed in several European countries.

As no CCS projects have been awarded funding in Phase I of the NER300 scheme, a successful Phase II is therefore essential to keep the EU CCS demonstration programme on track. A delay of even a few years will have a severe impact on the EU Energy Roadmap 2050, where CCS plays a key role in every scenario. In this respect, the NER300 funding are not necessarily available on an achievable timescale to the large demo-projects, an open call strategy would be welcome, enabling wide deployment by 2030.

Keep 'Climate Change' in the picture

CCS is necessary to decarbonise large parts of European industry, and measures should be considered to avoid carbon leakage impact on industry, which is willing to take the first steps toward such large-scale CO_2 reduction. Understand laws of scale.

CCS can only be discussed realistically, if all parties involved properly understand the scale, at which successful operations need to be run. The famous Sleipner project, injecting 1 Mt of CO_2 annually, is only a small CCS project. To reach the 2050 goal, we need about 2000 Sleipners by 2050, or fewer, but larger.

Increase the public awareness of climate change and the societal benefits of CCS. The largest survey of public awareness of CCS in the EU (Eurobarometer) shows that only 1 in 10 claims to know what it is. However, public endorsement will be crucial in determining the role CCS plays in the future climate change mitigation portfolio. CCS is one of the key solutions to reduce CO_2 emissions and it can serves as a bridging technology towards a carbon free European energy market. Member States should therefore work together to include climate change and mitigation mechanisms in school and high school teaching.

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