

6 June 2013  
Albert Borschette  
Conference Centre, Brussels

# NINTH COAL DIALOGUE



EURACOAL

# Programme

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Chair: Dr. Klaus-Dieter Borchardt, Director – Internal Energy Market, DG Energy

## Welcome and keynotes

From the European Commission – Dr. Klaus-Dieter Borchardt

From the European Parliament – Mr. Chris Davies MEP and Dr. Christian Ehler MEP

## Session I: Restarting the CCS agenda – the European Commission’s Consultative Communication on the future of CCS in Europe

“Presentation of the CCS communication”

Mr. Hans van Steen, Head of Unit – Renewables and CCS policy, DG Energy

The industry’s response – Mr. Peter Tjan, EU Advisor, 2Co Energy Ltd.; Mr. Paweł Smoleń, EURACOAL President; Dr. Wolfgang Rolland, Managing Director, Vattenfall Europe Technology Research; and Ms. Cristiana La Marca, Head of Emission Control Systems Unit, Enel Engineering and Innovation

Discussion with the audience – moderated by Mr. Hans van Steen

## Session II: CCS – research and demonstration

“Research programmes for CCS and related areas”

Dr. Jeroen Schuppers, Research Programme Officer, Energy conversion and distribution systems, DG Research and Innovation

“Prospects for the EU demonstration projects: how to ensure financing”

Dr. Reinhold Elsen, Head of R&D and Vice President, RWE Power and ZEP Executive Committee member; and Mr. Pedro Otero Ventin, Director of CO<sub>2</sub> Capture Programme, CIUDEN

Discussion with the audience – moderated by Mr. Janis Folkmanis, Principal Administrator, New energy technologies, innovation and clean coal, DG Energy

## Session III: CCS – how to ensure that the necessary infrastructure is in place

“Presentation of the TEN-E regulation and the process to identify projects of common interest”

Ms. Chrysoula Argyriou, Policy Officer – Internal Market I: Networks and Regional Initiatives, DG Energy

“Presentation of an industry-led CCS infrastructure study”

Dr. Ing. George Milojcic, Chair of EURACOAL Energy Policy Committee

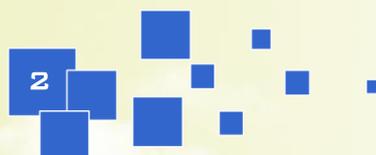
Discussion with the audience – moderated by Ms. Chrysoula Argyriou

## Wrap-up and conclusions

EURACOAL President, Mr. Paweł Smoleń and Dr. Klaus-Dieter Borchardt, Director, DG Energy

All presentations are available on the EURACOAL website ([www.euracoal.org](http://www.euracoal.org))

– only selected slides are included in this summary report.



# Introduction

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This, the 9<sup>th</sup> Coal Dialogue, jointly hosted by the European Commission DG Energy and the European Association for Coal and Lignite (EURACOAL), aimed to examine EU policy towards coal with a focus on carbon capture and storage (CCS) research, demonstration, infrastructure and deployment. The meeting was timely: on 27 March, the European Commission published its long-awaited consultative communication on the future of CCS in Europe.<sup>1</sup> At around the same time, the European Parliament began work on an own-initiative report on CCS,<sup>2</sup> so the dialogue provided a valuable opportunity for parliamentarians, officials, NGOs and industrialists to share views and ideas on CCS. A full list of participants can be found in an annex to this report.

Three sessions examined how to restart the CCS agenda, what further research was needed, why demonstration had failed, what now needed to be done and how to ensure that the necessary CCS infrastructure would be in place. The final session allowed the Commission and EURACOAL to draw some important conclusions on how and why CCS should be “restarted” in the EU. These are summarised at the end of this report, on page 13.

## Welcome & keynotes

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**Klaus-Dieter Borchardt**, Director – Internal Energy Market at DG Energy, opened the 9<sup>th</sup> Coal Dialogue by confirming that coal was currently the fastest-growing fuel in the world and would play – together with gas – an important role in the future energy mix of the EU, as shown in the European Commission’s *Energy Roadmap 2050*. At least 10 GW of additional coal power capacity is planned or under construction in Europe – some report as much as 50 GW – and, for many Member States, coal remains important. New coal-fired power plants reach high efficiencies

and are very flexible, making them partners for renewables which need reliable back-up. Coal and lignite add to security of energy supply by bringing diversity to the energy mix, indigenous production reduces import dependence and coal is competitive – very competitive in recent years.

In contrast to these positive messages, one cannot neglect the EU’s intention to decarbonise its economy. That is why coal – as well as other fossil fuels – will have to be decarbonised over the coming years. The development AND deployment of CCS technologies are therefore crucial and CCS must be put back on track. The EU had been active with its support: the CCS Directive, the European Energy Programme for Recovery (EPR) and the NER300. Yet challenges and hurdles lie everywhere, beyond the technological: there is no real political commitment to CCS, public acceptance is low, investors demand security for investments that risk being overtaken by technological developments and new infrastructure is needed, with cross-border links to storage sites. Only if the Commission, national and local authorities and the industry work together can these obstacles be overcome – the very purpose of the recent CCS communication.<sup>1</sup>

**Chris Davies MEP** agreed with the message from the Commission and quoted from Section 2 of a recent Chinese government notice, “CCUS pilot and demonstration should be promoted urgently. [...] Encourage CO<sub>2</sub> capture demonstration from coal chemical, oil and gas industries with high CO<sub>2</sub> concentration sources, develop pilot and demonstration projects for pre-combustion, post-combustion, oxyfuel and other CO<sub>2</sub> capture pathways. [...] Develop co-ordination mechanisms for different industries and sectors, strengthen CO<sub>2</sub> capture (supply side) and CO<sub>2</sub> storage (demand side) source and sink matching and linking. [...]”<sup>3</sup> Coal-dependent China wanted to get CCS up and running and Mr. Davies said that Europe would lose its leadership if the agreed research, development and deployment agenda fell further behind schedule. He added that Europe would not only lose its leadership, but would see emissions increase as the rest of the world continued to build low-efficiency power plants without CCS.

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<sup>1</sup> Consultative Communication on the Future of Carbon Capture and Storage in Europe, COM(2013) 180, 27 March 2013.

<sup>2</sup> Developing and Applying Carbon Capture and Storage Technology in Europe – implementation report 2013, European Parliament own-initiative procedure 2013/2079(INI).

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<sup>3</sup> Notice on Promoting Carbon Capture, Utilisation and Storage (CCUS) Pilot and Demonstration, National Development and Reform Commission (NDRC), China, 27 April 2013.

Some years ago, Mr. Davies noted, EU ministers agreed on ten to twelve CCS demonstration projects and some diverse instruments to co-finance these projects ... with absolutely nothing to show today. To see a CCS demonstration project, one has to go to Canada, the USA or even China! At the same time, national governments offered massive support for the deployment of renewables, adding to our electricity bills. Acknowledging a mistake, the Commission put its hope in a rising carbon price which would push industry to cut CO<sub>2</sub> emissions at costs closer to the cost of carbon abatement using renewables – the playing field would be levelled. However, the economy and hence carbon prices collapsed, so industrial emissions fell anyway. Even the attempt to back load allowances failed and, in any case, this would not have been a solution for CCS. Only a carbon price of €50 to €70/tCO<sub>2</sub> would incentivise industry to deploy CCS and no national government would stand for the resulting impact on energy-intensive industries or on electricity prices if utilities simply pass on costs to customers. Mr. Davies was dismissive of emission performance standards (EPS) for individual plants or any other “fix” that simply drove investment towards gas. He remarked that the car industry had to meet company-wide fuel consumption targets, so why not the electricity sector?

He noted that Member States pay huge subsidies to renewables, so one could ask why some of this money had not gone into CCS. It is time to think about infrastructure issues and maybe Member States should develop national “Energy Roadmaps” on how to establish a CCS infrastructure – he saw governments taking a leading role here. Politicians should rethink their ideas about the future energy mix. Renewables alone will not be the solution: low-carbon fossil fuels and CCS will be inevitable. He concluded with these words, “I want low-carbon coal and I want it now!”

After acknowledging the good work of Mr. Davies on changing attitudes towards CCS in the European Parliament, **Christian Ehler MEP** addressed the great pressures on the EU from rising electricity prices and decreasing industrial competitiveness. Provocatively, he asked if the CO<sub>2</sub> topic was dead, given the desperate economic situation facing Europe: would there be new GHG emission reduction targets or not?

The *Energy Roadmap 2050* shows clearly that CCS would be needed for both coal and gas in order to keep them in the future energy mix. There was no reason to give up on CCS, he said, but there was every reason to push it forward urgently. It was time for politicians and citizens to recognise that CCS was part of a solution; the German experience of renewables or nothing had led to high costs for small benefits. It was also time to clear up certain misplaced beliefs in, for example, the dangers of transporting and storing CO<sub>2</sub>. CCS demonstration projects do exist, but of the twenty or so operational projects, not one is located in Europe and the EU is slowly losing its leadership in this technology. Improved communication between politicians, industry and citizens is needed to make CCS work in Europe and to convince people of its benefits in relation to other energy technologies. Here, he lamented the failure to convince his own Brandenburg constituency.

In order to push CCS, a reliable CO<sub>2</sub> infrastructure was needed, as no CO<sub>2</sub> source sat on a convenient storage site. Large investments were needed in infrastructure which was a prerequisite to deploying CCS on an industrial scale. Another subject touched upon by Mr. Ehler was carbon capture and utilisation (CCU). Unfortunately, there was some resistance to including it in Horizon 2020, although it offers the potential for commercial exploitation without facing the same public resistance as CCS.

**Mr. Ehler** took the opportunity to question the internal structure of DG Energy since he had the impression that few if any posts were left to deal with coal-related issues. For example, CCS was being moved to DG Research which left it bereft of support from officials looking after the energy agenda. He sensed a gap between statements on coal from the Commissioner for Energy – whom he held in the highest regard – and practical action on clean coal.

On the last point, **Mr. Borchardt** replied that an entire unit in DG Energy was dedicated to coal, among other topics, and had a clear commitment to develop and support CCS as a policy imperative.

# Sessions

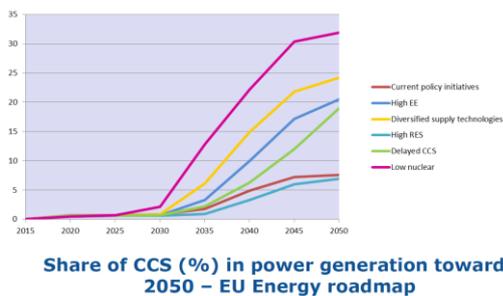
## Session I: Restarting the CCS agenda – the European Commission’s Consultative Communication on the future of CCS in Europe

### Presentation of the CCS communication

**Hans van Steen**, Head of Unit for renewables and CCS policy at DG Energy, presented the CCS Communication – the only policy document to accompany the *2030 Green Paper* and thus clearly showing the Commission’s commitment to CCS as a key element of the EU’s decarbonisation strategy post-2020.<sup>1,4</sup> Even as renewables gained importance, coal and gas would remain in the energy mix and play their roles, but with reduced emissions. Before then, a proper legislative framework was needed in order to successfully demonstrate CCS and to prove its commercial viability. Further innovation was needed, infrastructure would have to be put in place and last but not least public acceptance would have to be gained through much better communication.



### Role of CCS in the electricity mix



A legal framework for CCS was in place in the EU, but unfortunately no demonstration projects. Looking ahead, commercial viability would need a much higher CO<sub>2</sub> price whilst the infrastructure issue was

<sup>4</sup> Green Paper “A 2030 framework for climate and energy policies”, COM(2013) 169, 27 March 2013.

addressed in new guidelines for the trans-European energy infrastructure.<sup>5</sup>

One question was whether Member States with a high share of coal and gas in their energy mixes should be invited to develop roadmaps on how to decarbonise their electricity sectors by 2050 and to prepare national strategies for the deployment of CCS. Also to be discussed was whether to restructure the ETS in order to provide incentives for CCS deployment or whether the Commission should propose other means of support through recycling of auctioning revenues, for example, or other measures such as a CCS certificate scheme. Since public acceptance was critical to restart CCS, the current communication was a true “consultative communication” aimed at the public, industry and other stakeholders.

Brief gap assessment		
Condition	OK?	Comments:
1) Legislative Framework	Yes (?)	Storage is enabled by the CCS Directive (2009/31/EC)
2) Successful Demonstration	-	20 demonstration-scale projects running, but none in the EU (none from EEP or NER300)
3) Commercial Viability	No	ETS price too low
4) Public Acceptance	-	Challenges particularly with onshore storage
5) Infrastructure	Yes	Guidelines for Trans European Infrastructure
6) Innovation	Yes	Horizon 2020, The European Industrial Initiative on CCS (the SET plan)

### The industry’s response

**Peter Tjan**, EU Advisor for 2Co Energy Ltd., presented the 630 MW Don Valley project in the UK which was ready to enter the construction phase using expertise from Hydrogen Energy and Denbury Resources. The project is further supported by Linde and Samsung. It benefits from a domestic coal supply, CO<sub>2</sub> transport through a National Grid pipeline, ideal CO<sub>2</sub> storage conditions in the North Sea and no public acceptance problems. The CO<sub>2</sub> could be used for enhanced oil recovery (EOR) in oil fields or stored in saline aquifers. In fact, the biggest obstacle was financing. Here, Mr. Tjan stressed the

<sup>5</sup> Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure.

importance of having a stable financial framework as well as mechanisms for capital and operating support. In this context, the Commission's EEP programme and Member States' support in the form of, for example, feed-in tariffs are critical. He asked only that CCS as a low-carbon energy technology be treated equally with renewable energy sources. He added that the Commission should consider re-distributing the unused EEP funds earmarked for CCS among the remaining EEP projects. He called for a supportive policy NOW in the form of capital grants or loan guarantees, not promises of something for 2020. Mr. Tjan invited the coal industry itself as well as Member States to co-finance CCS projects. In a region that wants a low-carbon society, domestic coal producers may have no other option, he warned.

EURACOAL President **Paweł Smoleń** was well versed in the issues of CCS at Schwarze Pumpe, Jämschwalde and Bełchatów. In his view, all three projects failed because nobody was really serious about them and nobody wanted to turn them into success stories. Worse than that, when the projects were launched, the media was sceptical from the beginning and local people were misled with biased information on the dangers of CO<sub>2</sub> which came to be seen as a poison. Yet, these same people continued to use methane gas to cook in their homes, happily accepting the associated risks. President Smoleń called for the public to be properly informed on the real impacts of CCS. People are confused by the vocabulary used and many actions are not taken against CCS *per se*, but against unrelated issues such as opencast lignite mining and the impact on house prices. If CCS was to be restarted successfully, then a new approach was needed – one that started with CO<sub>2</sub> storage. He quoted from Mr. Ehler, "Don't take off without a landing strip." and concluded that CCS technologies will allow coal to be used in Asia and the USA, so why not in the EU?

**Wolfgang Rolland**, Managing Director of Vattenfall Europe Technology Research, was convinced that a long-term strategy was needed in order to clarify if industry should continue to invest in CCS after the many years spent on R&D with good results, notably at Schwarze Pumpe. In other parts of the world, CCS was being successfully demonstrated and if a clear political will and public acceptance had been in place in Europe, then CCS would have been successfully demonstrated here as well. However, there was no political support to implement the CCS directive and

no clear signals to invest in the urgently needed infrastructure.



Early support for CCS demonstration and for independent transport and storage companies was necessary, although Mr. Rolland believed that the market-based ETS should become the only support for CCS deployment – there should be no dedicated support for particular low-carbon technologies. Vattenfall would not give up its plans for a lignite-fired installation with CCS, but the company would wait for the necessary European infrastructure to transport the captured CO<sub>2</sub> to a safe storage site. He concluded by observing that renewables had made a convincing case by cleverly ignoring security of supply issues; an equally positive story was now needed for CCS.

**Cristiana La Marca**, Head of the Emission Control Systems Unit at Enel Engineering & Innovation, confirmed that the Enel Group had produced some valuable results from work funded under the EEP. These results were fundamental for the future deployment of CCS, this being key for the transition towards a low-carbon economy. To develop large-scale CCS demonstration projects, a business case must be made for the still very expensive technology. CCS could only be demonstrated if further funding was put in place – NER300 and EEP were clearly insufficient – which suggested fewer projects, perhaps run by consortia to better share risks and costs. Public acceptance was a further issue to be resolved – the delays in transposing the CCS directive contributed to suspicions and to a lack of urgency among authorities and project developers.

It was Enel's firm opinion that the EU ETS remained the best policy option to foster all low-carbon

technologies in the long term, including CCS. A CCS certificate scheme or even emission performance standards (EPS) were problematic since they would distort the carbon market. However, until it was commercially viable, CCS could not be supported by a market-based approach alone. Additional measures were needed, such as an extended NER300 or the re-allocation of unused EEPF funds.

## Session II: CCS: research and demonstration

### Research programmes for CCS and related areas

**Jeroen Schuppers**, Research Programme Officer for energy conversion and distribution systems at DG Research & Innovation, confirmed that CCS was at a crossroads and even if it were no silver bullet, it was a much-needed transition technology in support of the *Energy Roadmap 2050*. It is therefore a priority under the SET-Plan and should be deployed from 2030 onwards in order to reach the EU's decarbonisation targets. The Commission had put in place several instruments to support CCS: for example, the European Energy Programme for Recovery (EEPR) launched in 2008 earmarked €1.05 billion for up to seven CCS demonstration projects.

**Demonstration**

### EEPR funded projects

1. **ROAD, Netherlands**  
*Post Combustion, offshore storage depleted HC field*
2. **Jaenschwalde, Germany**  
*Oxyfuel, onshore storage, saline aquifer*
3. **Compostilla, Spain**  
*Oxyfuel, onshore storage, saline aquifer*
4. **Porto Tolle, Italy**  
*Post Combustion, offshore storage, saline aquifer*
5. **Belchatow, Poland**  
*Post Combustion, onshore storage, saline aquifer*
6. **Don Valley, UK**  
*IGCC, offshore storage depleted HC field*

Moving on to the EU's framework programmes for R&D, Mr. Schuppers said that, under the motto "one project – one funding rate", Horizon 2020 projects would be able to receive up to 100% of total eligible

costs, budgeting would be simplified, validation procedures would be shorter and controls and audits would be better targeted. In the next step, the Horizon 2020 programme foresees the demonstration of viable and safe geological storage, the application of CO<sub>2</sub> capture technologies to other industries, including bio-CCS, and the handling of CO<sub>2</sub> not only as a waste but as a resource.

**SET-Plan**

### The technology pillar of EU's Energy & Climate Policy

- **Steering Group** – European Commission and Member States
- Openness and transparency in the decision-making process supported by the SET-Plan Information System **SETIS** - <http://setis.ec.europa.eu>
- Innovation creation - the **European Energy Research Alliance (EERA)**
- Innovation development and demonstration - the **European Industrial Initiatives (EIIIs)**
- European Energy Education and Training Initiative

Horizon 2020 will therefore continue to support CCS as part of the SET-Plan, but with all activities centralised in DG Research. The stronger involvement of Member States would be crucial to realise pilot projects. Further stakeholder interaction was also needed in order to extend CCS to other carbon-intensive industries (e.g. through SPIRE) and knowledge sharing had to be continued and further promoted, including at the international level. Conventional power plant R&D could be included in Horizon 2020 if there was a political mandate from Council – the Commission, he said, was open to make this change if requested by Member States.

**Research**

### CCS in Horizon 2020

#### A challenge-based approach

- **Viability of safe geological storage has to be demonstrated**
- **Application of CO<sub>2</sub> capture technologies to other industries, including Bio-CCS, can open-up new opportunities**
- **Cost of capture needs to come down**
- **CO<sub>2</sub> may also be a source rather than just a waste**

**Knowledge sharing**



### CCS Demonstration Projects Network

**CCS Project Network main goals:**

- ✓ Accelerate the deployment of CCS on an industrial scale
- ✓ Benefit from knowledge sharing, joint communication activities and a European identity

**CCS Project Network main tasks:**

- ✓ Co-ordination of EU CCS demonstration projects
- ✓ Communicate concrete results from the projects
- ✓ Actions to build public confidence
- ✓ Promote international cooperation



3. Demonstration projects – needs & status

### Obstacles to ensuring sufficient demonstration of CCS in the EU



No materialised CCS funding in 1st tranche of NER300 funding – no confirmed CCS demonstration projects in Europe	Lack of public acceptance and political support in member states	Limited understanding of the commercial and technology challenges associated with CCS	Currently low CO2 prices lead to lack of business case for CCS demonstration and later commercial deployment
Failure to adequately recognise and reward the early movers seeking to invest in the first projects	Intensive promotion of renewables in some member states and unequal conditions for RES and CCS	No clear confidence that energy and climate policy will deliver a viable and vibrant CCS market	Lack of long term investment signal from the EU ETS and policies that can drive investment in CO2 transport and storage infrastructure



### Prospects for the EU demonstration projects: how to ensure financing

**Reinhold Elsen**, Head of R&D and Vice President, RWE Power and ZEP Executive Committee member, was convinced of the necessity for CCS – as assumed by the *Energy Roadmap 2050*, by the new CCS Communication and by the IEA – but said that CCS was far behind its original schedule with no EEPR or NER300 projects moving forward. He cautioned participants that although CCS came at a price, global warming would have a much higher price. Whilst CCS was key to future coal use, he added that in ZEP’s view, Europe did not have until the 2030s to develop CCS technologies – demonstration must happen over the next decade to keep Europe on track. Like previous speakers, he addressed the lack of projects in Europe, the lack of public acceptance and the lack of confidence in CCS transport and storage, although he was certain that capture technologies were now ready for large-scale demonstration.

Most importantly, **Mr. Elsen** turned to the current low carbon price which did not give an investment signal for CCS. However, he added that for CCS it was not a question of today’s ETS allowance prices – the market was working and prices reflected the economic situation. Low carbon prices would help recovery, CO<sub>2</sub> targets would be met and so there was no need to interfere in the market. Instead, dedicated support for CCS demonstration was needed, such as feed-in tariffs or capital grants for a limited number of demo projects. The introduction of an emission performance standard (EPS) would not be a solution, in the view of ZEP, since this measure is only appropriate in a mature market. CCS certificates should only be considered if carefully designed and limited in time and scope. Finally, Mr. Elsen called for a rethink on the impact of competition from subsidised renewables which means lower load factors for conventional plants, destroying the return on investment for capital-intensive CCS plants.

3. Demonstration projects – needs & status

### The need for CCS demonstration projects



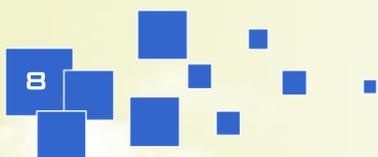
To make CCS a key contributor for a low carbon economy, it needs to be made commercially available in the twenties and widely deployed by 2030	Final demonstration project decisions need to be made in short term in order to keep Europe in the race	Deployment cannot wait until 2035
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4. ZEP key recommendations (1)



- **Delivering CCS has to be a priority** or the EU is likely to miss its own long term CO<sub>2</sub> reduction targets
- EU CCS demo projects are ready for activation but **need sufficient financial support in order to take investment decisions**
- CCS ought to be a top priority for **NER300-2 funding**
- **Governments should provide co-funding especially infrastructure** to ensure that demonstration projects are up and running in Europe to keep us on the right track towards commercial deployment
- EU and Government have to support industry and expand measures to **improve public acceptance**

#### 4. ZEP key recommendations (2)

- ▶ **Need for a clear political statement of strategic intent** to provide confidence to industry for CCS demonstration and deployment in Europe
- ▶ **Europe must incentivise a successful CCS demonstration programme** between 2015 and 2020
- ▶ A robust ETS is important, however, we need a predictable driver for CCS. We need additional support schemes for demonstration plants and in the long term a market driven development mainly based on a volume based ETS.
- ▶ **Need for continued engagement and dialogue** with all stakeholders at EU and national level



#### CIUDEN

**Focus on** doing the **doable**

- Complete CCS (Capture, Transport & Storage)
- Precommercial medium-scale facilities
- Next generation of CCS test facilities easy to integrate
- Knowledge sharing + Technical training
- Public perception



CIUDEN presentation June 6<sup>th</sup>, 2013

3

CIUDEN is willing to share its knowledge and technical training and also its experience in communicating successfully with local people. It is the EU's most versatile CCS pilot plant and is sitting ready to be used to optimise CCS technologies over the coming years.

**Pedro Otero Ventin**, Director of the CO<sub>2</sub> Capture Programme, CIUDEN, presented this pilot project which was established in 2006 by the Spanish government as a non-profit R&D institution fully dedicated to collaborative research in CCS and CCTs.

#### CIUDEN – An initiative of the Spanish Administration



CIUDEN was created by the Spanish Government in 2006 as a non-profit R&D institution fully conceived for **collaborative research in CCS and CCTs**.



**es.CO<sub>2</sub> Centre**  
 PC boiler: 20 MW<sub>th</sub>  
 CFB boiler: 30 MW<sub>th</sub> max.  
 Biomass gasifier: 3 MW<sub>th</sub>  
 CPU and CO<sub>2</sub> transport experimental facilities  
 Fuels: coals, biomass, pet coke

**Hontomin site**  
 CO<sub>2</sub> geological storage in saline aquifer on shore  
 Estimated capacity: 1,900,000 t

CIUDEN presentation June 6<sup>th</sup>, 2013

2

#### Next steps

- CIUDEN facilities are ready to contribute to the development and medium-scale demonstration of **Carbon Capture, Transport and Geological Storage**



Full chain of CCS in precommercial and medium-scale facilities

#### ✓ Permitting

\* CIUDEN has **all necessary permits** for capture and storage in on-shore saline aquifer (actual permit up to 100,000 t; estimated site capacity 1,900,000 t).

#### ✓ CIUDEN is not a project, it is a reality

CIUDEN presentation June 6<sup>th</sup>, 2013

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#### CIUDEN's proposal: from 2500 to 7000 hours/year for technological development and demonstration

- 1. Integrated project** for Carbon Capture, Transport and Geological Storage in 1st generation of CFB oxy-fuel thermal plants and aquifer saline storage
- 2. Co-combustion** coals + biomass (*carbon negative*)
- 3. CCS + CCU** (two CO<sub>2</sub> streams)
- Natural Gas Combined Cycle (**NGCC**) / **Fuel cell**
- Experimented and continuous work on **public perception**
- Other developments:** second and third generation of oxy-combustion, chemical looping, fuel cells...

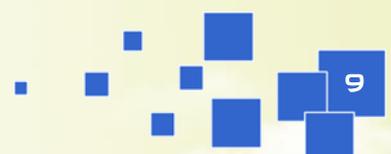
+ Less risks  
Public perception

Technology maturity at low cost

CIUDEN presentation June 6<sup>th</sup>, 2013

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CIUDEN manages two projects: a capture installation as well as an onshore storage site in a saline aquifer: an investment of €160 million. CIUDEN has demonstrated that CCS is "doable" and it is now ready to enter the next phase to demonstrate oxy-combustion at large pilot scale, having obtained all the necessary permits to capture and store CO<sub>2</sub> onshore.



## Discussion

The subsequent discussion focused on the need for broader financial funding for research and the need to differentiate research from large-scale demonstration, where important financial commitments are needed. **Alan Haigh**, Head of Unit RFCS at DG Research, noted the role that the EC Research Fund for Coal and Steel played in funding CCS-relevant research, but not CCS demonstration which needed a financial instrument on a much larger scale. **George Milojevic** of EURACOAL agreed on the need for separate instruments for research and market deployment, but observed that there was not a smooth transition between the two. **Janis Folkmanis**, Principal Administrator for new energy technologies, innovation & clean coal in DG Energy, admitted that it was not so easy to re-distribute or re-allocate public monies (*i.e.* EEPR funds) for demonstration since EU rules had to be respected or new rules agreed by politicians. He added that the SET-Plan and the European CCS Industrial Initiative (EII) would continue to be important guides to future CCS research funding and developing plans for CCS in co-operation with Member States.

### The EII



#### European Industrial Initiative on CCS

A 10-year programme (launched July 2010) of private/public actions in a dual-track approach:

**Demonstration of CCS at full-scale...**

- through a set of power plants (~250 MW) with different capture, transport and storage options
- with a relevant geographical spread
- to prepare the way for fully commercial implementation

**A comprehensive R&D programme to**

- develop more efficient and cost-competitive capture technologies
- extend the application of CCS to other carbon intensive industries

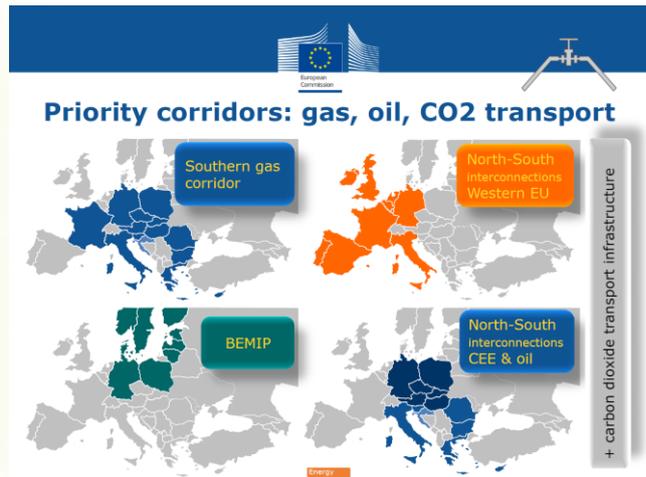


## Session III: CCS: how to ensure that the necessary infrastructure is in place

Presentation of the TEN-E regulation and the process to identify projects of common interest

**Chrysoula Argyriou**, Policy Officer – Internal Market I: Networks & Regional Initiatives, DG Energy presented the Energy Infrastructure Package, dealing

with investment challenges, guidelines and connecting facilities. Necessary investments up to 2020 are estimated at €200 billion and the Commission is currently revising the TEN-E policy in order to identify EU projects of common interest (PCI). General criteria for the infrastructure priorities will be economic, social and environmental gains, the involvement of at least two Member States to ensure significant cross-border benefits and specific criteria such as market integration, security of supply through diversification and a sustainable energy mix including the integration of renewables.



Permitting processes will be facilitated and transparency increased in order to enhance public participation. There will be priority corridors through Europe for the transport of gas, oil and CO<sub>2</sub>, and four priority electricity corridors.

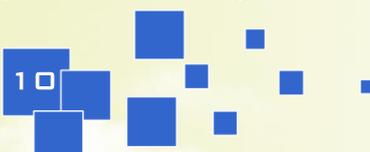


### The Regulation and the carbon dioxide networks

Priority Thematic Area in view of facilitating the deployment of CO<sub>2</sub> capture and storage and aims to develop carbon dioxide transport infrastructure between MS and with neighbouring countries

- In the short run, through this thematic group we can establish a dialogue with MS and related stakeholders
- In the long run, identify Projects of Common interest falling within the criteria of Article 4 of Regulation 347/2013

Between 2014 and 2020, the Commission will put in place grants totalling €5.1 billion. The new Infrastructure regulation came into force mid-May and the next steps will be a stakeholder consultation, the drafting of regional lists for projects of common interest and finally the adoption of this list by the Commission. The regulation also



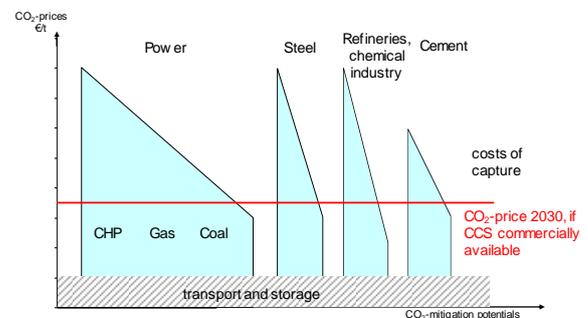
aims to facilitate the deployment of CO<sub>2</sub> capture and storage and to develop CO<sub>2</sub> transport infrastructure between Member States and neighbouring countries.

## Presentation of an industry-led CCS infrastructure study

**George Milojcic**, Chair of EURACOAL's Energy Policy Committee, presented a project proposal on the "Benefits, design and financing of a CO<sub>2</sub> transport and storage infrastructure". It is well understood how infrastructure, such as roads, railways, ports and telecoms contributes to economic growth and regional development. Any infrastructure must be provided on time, at a competitive price. In relation to how, when and where a CCS infrastructure can add to growth, several prerequisites will be necessary.

Secondly, an open infrastructure will be a priority before the implementation of CCS can really happen. Finally, the ETS should be the central instrument for promoting CCS: the current debate on short-term intervention in the carbon market is irrelevant to the deployment of new technologies.

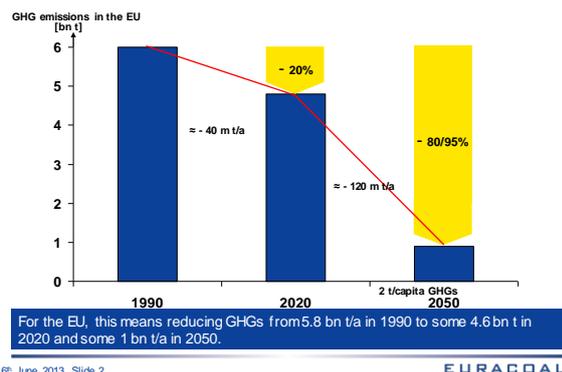
### Is CO<sub>2</sub>-infrastructure a coal question?



6<sup>th</sup> June 2013, Slide 5

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### Mitigation of climate change in the EU two stages – two speeds

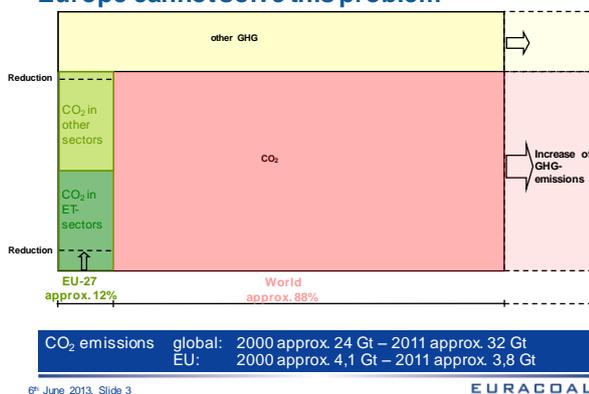


6<sup>th</sup> June 2013, Slide 2

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One should further consider that CCS is not an issue for coal alone. Take coal out of the equation and the CO<sub>2</sub> problem remains, but you have lost all the security and cost benefits of coal. While CCS is already practiced by the oil and gas industry and at pilot plants, its industrial-scale application appears to be more challenging than expected. Various capture technologies have been tested and CO<sub>2</sub> capture will certainly continue to be the responsibility of plant operators. However, these same operators are unfortunately not specialists in CO<sub>2</sub> transport or storage: others need to make a business out of these crucial links in the CCS chain.

### Climate protection is a world-wide challenge Europe cannot solve this problem



6<sup>th</sup> June 2013, Slide 3

EURACOAL

Firstly, a binding international CO<sub>2</sub> agreement is needed before the EU can legally push industry to dramatically cut its emissions before 2020; beyond then, the post-2020 debate has only just begun.

### Reducing CCS complexity

- CCS technology demonstration in the power sector, as an integrated process, is proving to be difficult.
- There is a lack of concepts for the industrial application of CCS.
- A separation of the key CCS steps now seems reasonable:
  - CO<sub>2</sub> capture carried out by operators of facilities: the technologies exist (three processes for power generation), but industrial applications need incentives;
  - CO<sub>2</sub> transport & storage infrastructure constructed and operated by specialist companies: CO<sub>2</sub> transport is proven, but public acceptance and regulation are needed, whereas CO<sub>2</sub> storage needs cooperation between regions and competition between providers.

Governments should guarantee non-discriminatory access to a CO<sub>2</sub> transport infrastructure and ensure sufficient CO<sub>2</sub> storage capacity in the future.

6<sup>th</sup> June 2013, Slide 4

EURACOAL

For various reasons, the deployment of CCS has been delayed. A new approach is therefore being considered under the heading "infrastructure first". Plant operators will only implement CO<sub>2</sub> capture if a

suitable transport and storage infrastructure is in place: the ETS will ultimately push CCS, but it can be pulled with an accessible infrastructure. The gas and electricity sectors show us that open networks generate added economic value well beyond their actual costs. The risk of extremely high CO<sub>2</sub> prices or price volatility will be substantially reduced by open and non-discriminatory access to a CCS infrastructure – thus de-risking industrial investments of all types in Europe. Indeed, the IEA has calculated that the cost of a strategy to reduce CO<sub>2</sub> without CCS would be 40% higher than one with CCS.

The proposed study will focus on countries around the North Sea (e.g. Germany, the UK, the Netherlands, Denmark and Norway) as well as in Central Europe (e.g. Poland and the Czech Republic). The introduction to the study will analyse the general impact of infrastructure on prosperity and growth. The second part will deal with climate protection strategies and the importance of CCS. If economic development and secure power (e.g. in Germany without nuclear energy) over the period from 2020 to 2050 depend on CCS, then it should be seen as a “public good”. The costs of financing a CCS infrastructure might then have to be borne by society at large, rather than directly by users. However, this is just one of the questions yet to be answered.

### CO<sub>2</sub> infrastructure as location factor

- The utilization of oil, gas and coal, increasingly after 2020 and – as things stand today – only possible at all in 2050, with carbon capture.
- Security of supply in the electricity sector and industrial production are linked with CCS technology in the medium term already.
- A CO<sub>2</sub> transport and storage infrastructure will be needed after 2025/2030.
- An open CO<sub>2</sub> infrastructure creates planning certainty, since a problem is then solved that is unsolvable by “individuals”.
- A CO<sub>2</sub> infrastructure makes the future calculable for investors, because a “maximum price” is defined for CO<sub>2</sub>.

Upshot: The need for carbon capture and a CO<sub>2</sub> transport and storage infrastructure follows from the climate targets and the fact that Central Europe is to remain an industrial region.

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The debate on the economic benefits of a CCS infrastructure leads quickly to the question of how to match its development with demand. CO<sub>2</sub> supply volumes and prices must be estimated in advance to allow the design of financing options.

CCS opens the possibility of maintaining industrial activity in Central Europe whilst decarbonising the

economy. Governments must understand that putting more and more pressure on power plants and heavy industry will see them close and relocate outside the EU, rather than build CCS infrastructure within the EU. In order to maintain a competitive market it will be important not to rely on one single technology or one single fuel: renewables with gas alone would kill competition. In addition, CO<sub>2</sub> sinks will also be needed to offset emissions in sectors where they are difficult to avoid, such as air and sea transport and road cargo.

### Discussion

In the subsequent discussion, **George Milojevic** again addressed investment security for power generators who could not finance CCS projects without an available transport infrastructure. He envisaged a step-by-step build up using flexible transport in the early days – as at Rotterdam – and including a small number of storage sites. **Wolfgang Rolland** questioned the Commission’s criteria on the cross-border benefits of pipelines and added that, in his view, the TEN-E guidelines should be far more creative on CCS. **Brian Ricketts**, Secretary-General of EURACOAL, questioned the overall functioning of the internal market given the distorting effect of renewables subsidies which certainly did not benefit consumers. He suggested that DG Competition might take an interest in why the internal energy market was looking less and less like the competitive market envisaged at the outset.

# Wrap-up & conclusions

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Summing up the 9<sup>th</sup> Coal Dialogue, **Mr. Borchardt** made the following points:

- Everyone acknowledged that CCS will be crucial to keep fossil fuels – coal, gas and oil – in a future low-carbon energy mix.
- If Europe does not want to lose its leadership, then it must move ahead with CCS or risk losing out to China, the USA and others. However, current progress is alarmingly slow with some of the initial demonstration projects cancelled and none ready for a final investment decision.
- However, lessons can be learnt from failure and a new focus defined – helped by knowledge sharing.
- The most difficult issue will be how to make a business case out of CCS which demands a stable policy framework on climate, energy, environment and R&D, one that provides confidence to industry.
- All funding possibilities must be explored: capital grants, loan guarantees, price support such as feed-in tariffs or contracts for difference (CFDs), or the distribution of ETS auctioning revenues. Indirect price support via a carbon tax would have other consequences, but cannot be ignored, especially if a long-term structural reform of the ETS were not completed.
- There must be a level playing field for all low-carbon technologies: the Commission's current review of renewable support mechanisms across the EU was an important step in that direction since renewables must eventually stop receiving special treatment.
- Capture technologies are mastered and demonstrated, so focus in the future must be on the demonstration of transport and storage. Industry and Member States must become "CCS facilitators" and it would be interesting to hear more about projects in Norway where good progress has been made.
- Public acceptance must be carefully regained with more precise vocabulary to avoid misunderstandings: for example, "de-carbonisation" does not mean the phase-out of coal, as many Europeans think, but refers to the efforts to lower CO<sub>2</sub> emissions.

- A wider-ranging communication is needed to avoid the general public rejecting all new technologies. The current delay in demonstrating large-scale CCS only reinforces public mistrust.
- Member States should demonstrate their commitment to CCS and promote its benefits on economic growth and job creation – the EU institutions cannot do this alone.
- A CCS infrastructure appears to be key, so infrastructure financing must be addressed in detail and whilst the TEN-E guidelines might not have a short-term impact, they offer a basis for developing a master plan for a CCS infrastructure in 5-10 years, probably a public-private infrastructure.
- Binding international targets are urgently needed in Paris in 2015 if the EU is to avoid backtracking on its own commitments. The EU cannot fight climate change alone: its emissions are a relatively small share of the global total. Moreover, the public cannot be expected to pay for unilateral action simply to watch emissions rise elsewhere in the world for no net gain.

EURACOAL President **Mr. Smoleń** concluded with some general thoughts on public and state perceptions: CCS delays clearly contributed to public mistrust and it will be difficult to restart the CCS agenda from square one, especially when faced with unjustified fears on the dangers of CO<sub>2</sub>. He observed that Europe was good at setting rules on what *not* to do, but CCS needed rules on what to do, so first we must formulate the right questions. Recently, national governments and MEPs had expressed their disagreement in voting against the ETS back-loading proposal, giving a signal that the public and hence politicians are starting to consider the impacts of climate policy on the EU economy. Mr. Smoleń saw this as a good sign since it should lead to a more productive debate between EU institutions, governments, NGOs, industry, unions and the public on policy issues in terms of real hopes and real fears, rather than allowing the agenda to be hijacked by single interest groups demanding easy money. He was optimistic that solutions for CCS would be found.

Closing positively by mentioning the CIUDEN project – the whole of CCS in a nutshell – both agreed that CCS is clearly "doable", no action is not an option and that projects in the EU could move ahead quickly if Member States, the Commission and industry co-operated on "restarting" CCS. ■

# Participants

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