

CCS on Biomass – will there be enough biomass?

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Carbon Capture and Storage: A New Solution or Another Problem

Seminar at Klimaforum09, Copenhagen 14th December 2009

Arguments to make Energy Plans without CCS

- CCS is unable to deliver sufficient reductions.
- The reductions that CCS might provide will come too late.
- CCS increases energy consumption by power plants in the order of 40%.
- CCS binds us to centralized and inflexible energy supply system based on coal.
- The demand for “CCS-ready” coal fired power plants will just allow more coal fired plants to operate for many years while the technology is developed, storage sites are identified and financing is secured.
- **CCS-plants with for example 30% co-firing of biomass will in Denmark as in EU-27 lead to a complete exploitation of the accessible biomass – or depend on a problematic import.**
- CCS is a very expensive way to reduce CO2 emissions.
- CCS can only be realized with many billions of Euro in subsidies from taxpayers.
- There are cheaper and better alternatives.
- CCS entails excessive, harmful environmental impacts.
- It will be the public or future generations that must pay if something goes wrong.
- CCS will strengthen our dependence on coal and prevent the development of 100% renewable energy systems.
- **CCS in CDM will increase the importance of CDM and diminish domestic reduction efforts**

Definition of Biomass – what is included?

- Straw
- Wood
- Biomass for biogas
- Biodegradable fraction of waste

Danish resources of biomass for a flexible energy system or for biomass-CCS?

- Biomass resource potential, (Danish Energy Agency, 2006): 165 PJ
- Danish coal use 2008: 172 PJ
- Danish coal use 2008 with CCS (40% more due to the excessive use of energy in the capture process): 241 PJ
- Present biomass production, Energy Statistics 2008: 82 PJ
- Remaining biomass potential: 83 PJ
- 30 % of Danish coal use replaced with biomass: 52 PJ
- 30% co-firing with CCS will take 40% more biomass due to the excessive use of energy in the capture process: 73 PJ

Conclusion

- **30% co-firing with biomass-CCS takes 88% of the remaining biomass potential – leaving almost nothing for other purposes (e.g. decentralized biomass CHP backup in a flexible energy system)**
- **100% biomass CCS takes 290% of the remaining biomass potential – no biomass left for other purposes - rely on problematic import of biomass from abroad**
- **Biomass-CCS prevents biomass CHP and a sustainable and flexible RE system**

European resources of biomass for a flexible energy system or for biomass-CCS?

- Biomass resource potential, (EEA Rep. No. 7, 2006): 7892 PJ (estimate for 2010)
- EU-27 coal use 2007: 13613 PJ
- EU-27 coal use 2007 with CCS (40% more due to the excessive use of energy in the capture process): 19058 PJ
- Present biomass production, (EEA Rep. No. 7, 2006): 2889 PJ
- Remaining biomass potential: 5003 PJ
- 30% co-firing with CCS will take 40% more biomass due to the excessive use of energy in the capture process: 5717 PJ

Conclusion

- **30% co-firing with biomass-CCS takes 114% of the remaining EU-27 biomass potential – no biomass left for other purposes (e.g. decentralized biomass CHP backup in a flexible energy system)**
- **100% biomass CCS takes 381% of the remaining biomass potential – no biomass left for other purposes and rely on problematic import of biomass from abroad**
- **Biomass-CCS prevents biomass CHP and a sustainable and flexible RE system**

CCS and offsetting – how will CCS impact CDM?

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What is CDM?

Clean Development Mechanism - one of the Kyoto Protocol's flexible mechanisms

- CDM lets countries with binding reduction targets under the Kyoto Protocol (Annex 1 countries) buy reductions or offsets in countries without such commitments (non-Annex 1 countries). Governments or companies in Annex 1 countries can invest in greenhouse gas reduction projects in non-Annex 1 countries like e.g. technology for reducing emissions of industrial gases or for the recovery of biomass. The resulting greenhouse gas reductions can subsequently be credited in the national CO₂ accounts or sold in the EU emissions trading system.
- JI (Joint Implementation) is basically identical to the CDM except that JI projects are contracted between two parties who both have committed themselves to binding reductions.
- The philosophy that lies behind these mechanisms says that greenhouse gas reductions should take place where costs are lowest, which in general means in the developing parts of the world. Because of the potential volume of the technology an inclusion of CCS in the CDM would raise a series of problems.

Problems related to the inclusion of CCS in CDM

- The extent and importance of the CDM will increase with the acceptance of CCS in the CDM.
- CCS has the potential to flood the world's CO₂ trading systems with credits with large decreases and fluctuations in the CO₂ allowance price as a consequence. This will inhibit innovation and development of CO₂ reduction technologies at home.
- CCS in CDM will enhance developing countries' dependence on coal.
- Developing countries will commit their energy future to a centralized system with a large input of carbon, and thus miss the opportunity to go directly to a sustainable, decentralized energy supply system based on local renewable energy sources.
- Developing countries are likely to be stuck with long-term storage responsibilities and unintended adverse consequences of the CCS technology.
- Rich countries will benefit from the inclusion of CCS in the CDM through a substantially increased quantity of cheap project credits tending to weaken the domestic reduction efforts.
- CCS in the CDM - like CCS technologies in general - has not been subjected to a thorough public debate.

European CO₂-reductions without CCS and without offsetting

% in 2020, 2030, 2050 (1990 base)

- Towards a Fossil Free Energy Future, SEI, 1993 (55, 76, 81) GHG
- Towards Sustainable Europe, WI, (1995) (-, 68, 77)
- INFORSE, 2004 (35, 50, >95)
- GP Energy (R)evolution, 2007, (-, -, 50 global)
- Future Energy Scenarios for EU-27, Ea Energianalyse, 2008, (-, 50 EU-27 small tech, -)
- **Europe's Share of the Climate Challenge – Domestic Actions and International Obligations to Protect the Planet, SEI, FoEE, 2009 (40, -, 90)**

Danish CO₂-reduction plans without CCS

% in 2020, 2030, 2050 (1990 base)

NOAH, 1996 (-, 67, 100)

Danish Board of Technology, 1994 (-, 60/100, -)

Danish Society of Engineers, 2008 (-, 57, 100)

Energipolitikken teknologiske råderum, GP, 2006 (57, 72, -)

Nedtrapning af CO₂-udslippet, GP, 2008, (40, 67, -)

Social Democrats, 2008 (-, 60, 100)

Social Liberal Party, 2007, (-, -, 81)

Red Green Alliance, 2009, (-, -, 100 in 2040)

Danish Organization for Sustainable Energy, 2009 (-, 100, 100)

NOAH, 2009 (draft version at www.global-klima.org) (66, 100, 100)

Nordic CO₂-reductions without CCS

% in 2020, 2030, 2050 (1990 base)

Meyer et al., 1993, (-, 100,100)

Et nordisk energiscenario, GP, 2006 (30, 67, -)

Final remarks

- The 2-degree GHG-budget call for urgent CO₂-reductions within the next few years and within that time frame CCS can not deliver
- Biomass CCS is a big mistake that will confiscate all available biomass resources in EU-27 and exclude the use of this resource for any other purpose
- Wind mill building capacity can be expanded fast due to free shipyard capacity in Europe. Also former shipyard workers can easily be upgraded to build wind mills and other renewables
- There is an enormous amount of documentation on how deep CO₂-cuts can be done without CCS for 2020, 2030 and 2050
- This knowledge about energy systems and RE scenario building can be useful in the future process with technology transfer to LDCs