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Carbon capture and storage

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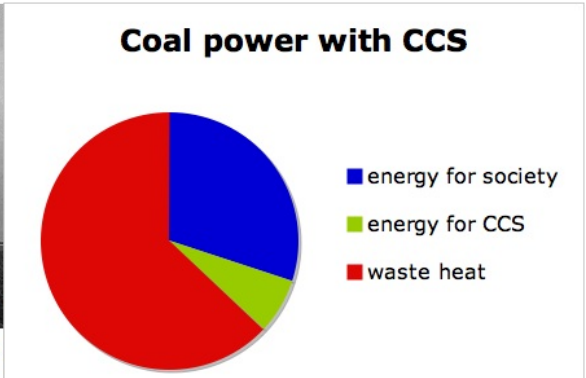
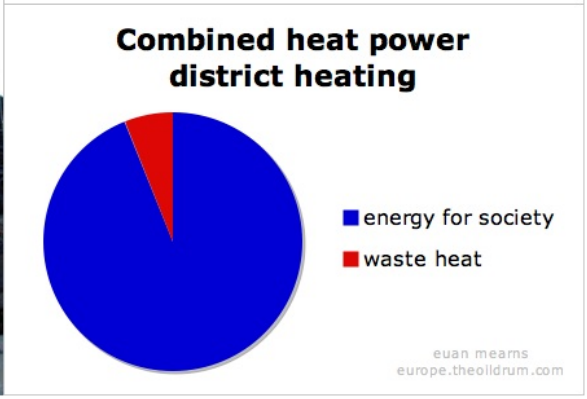
Topic: Policy/Politics
Tags: carbon capture, carbon dioxide, ccs, chp, co2 eor, eor, original [list all tags]





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Carbon capture and storage (CCS) involves removing carbon dioxide from the combustion stream of fossil fuel powered generating plant and sequestering it under ground in water-bearing geological strata. The objective is to reduce or eliminate CO_2 emissions from electricity generation with focus on coal-fired plant.

CCS has three main elements:

- Capture of CO_2 either pre- or post-combustion
- Transport to burial site, normally by pipeline
- Compression and burial in geological strata

The process involves large-scale engineering work, is expensive and uses a significant proportion of the power generated by the plant. The IPCC estimate that the **energy cost** is somewhere between 20 and 25%. In the UK the **average efficiency of coal-fired plant is 37%**, with 63% of the energy lost as waste heat. With CCS the energy efficiency drops to 30% assuming 20% of the power produced goes to bury CO_2 rather than to power society.

An alternative to CCS is to burn less coal. **Combined heat and power** (CHP) generation involves capturing the waste heat from power stations and pumping this hot water to neighbouring houses in district heating systems. Danish CHP plant is **over 90% energy efficient**. Thus 3 times as much energy is extracted per unit of fossil fuel in CHP compared with normal plant fitted with CCS and this may equate to 67% reduction in coal use. Energy costs should therefore be reduced at national and individual level and CO_2 emissions reduced by similar amount.

In Denmark, a certain CHP plant is also fitted with CCS. This is truly the belt and braces approach to environmental care.

Jevon's paradox once again rears its ugly head. Governments must therefore legislate for energy efficient homes and appliances to avoid pointless waste of cheap energy that CHP may provide.

The obvious draw back with CHP is the engineering work required to build new plant and install district-heating systems in major cities. Given the political will, the **Danes, Dutch and Fins** have proven this is possible to achieve.

Conventional CCS is quite distinct from **CCS-EOR** (enhanced oil recovery). This process is related to CCS with the difference that the CO_2 is buried in a mature oil field. Given favourable geology, the CO_2 is miscible with the residual oil which may be mobilised towards production wells and which may otherwise have been left behind in the depleted reservoir. The primary objective here is to increase oil recovery. The additional oil produced may pay for the exercise though economics may be marginal depending upon the setting. The sequestered CO_2 tends roughly to balance the additional CO_2 from combustion of the extra oil produced.

Most existing CCS-EOR projects utilise natural sources of CO_2 produced from geological strata and do not yet use CO_2 from power generating plant. StatoilHydro's flagship Sleipner CCS project also buries natural CO_2 co-produced with oil and natural gas from the Sleipner Field. **One report** suggested that this CO_2 may be leaking back to surface, but recent work by Statoil **suggests it is not**.

See also 2 stories by Rembrandt

CO2 Capture and Storage: The Energy Costs

CO2 capture and storage: The economic costs

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