

## Perspectives of CCS in Europe considering technical and economic power plant uncertainties

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**Abstract.** The perspectives of power plants with carbon capture and storage (CCS) in Europe are analysed with the Pan-European TIMES model (TIMES PanEU) incorporating technical and economic uncertainties of CCS technologies by the use of the Parametric Programming routine. Thereby the analysis considers two different climate policy regimes for Europe.

The market share of CCS power plants is highly influenced by the climate policy. Under an ambitious climate policy regime (greenhouse gas reduction 83% in 2050 compared to Kyoto base) the electricity demand increases up to 6500 TWh in 2050 in the EU-27 plus Norway, Switzerland and Iceland (EU-27+3), with a high contribution of CCS power plants (almost 40%). The technical and economic parameters of CCS power plants can determine the market share significantly. Especially in early periods (2020 and 2030) and less tight GHG reduction obligations in 2040 and 2050 the enhancement of the performance of CCS technologies can cause additional electricity generation from CCS power plants up to 600 TWh for the EU27+3. Thereby improvements of capture performance can lead to additional electricity quantities to the system, satisfying the growing demand and to the substitution of alternative electricity generation technologies, e.g. natural gas combined cycle without CCS.

Regarding the influence of future CCS power plant parameters the analysis shows that in early periods (2020 and 2030) reductions of invest costs have a higher impact on the electricity generation from CCS power plants since CCS power plants are primary based on solid fossil fuels, and their economics are consequently stronger influenced by invest costs than efficiency improvements. In later periods (2040 and 2050) more natural gas fired CCS power plants operate on the market, which are more sensitive to fuel prices and thus efficiency improvements have a higher effect on these technologies.

**Keywords.** Carbon capture and storage, Europe, energy system, climate policy, technology adoption, parametric programming.