# The role of CCS in long-term climate mitigation: the impact of uncertain CO2 storage availability

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**Abstract**. A major characteristic of the long term climate energy system is the large uncertainty concerning both, the future environmental requirements as well as the tools available for fulfilling these. One potential key technology for bridging the transition from the current fossil dominated energy system to a more sustainable one is carbon capture and storage. However, there are large uncertainties concerning the large scale implementation of this technology, one being the regional availability of storage sites for the captured carbon. We approach the issue from an energy system perspective and use the energy system model TIAMEC to study a set of scenarios covering a range of climate targets and technology futures, from two angles; 1) a sensitivity analysis consisting of a number of scenario that assume perfect foresight for the decision making and 2) a stochastic programming set-up, which allows the model to consider all included potential future states simultaneously. We find that if a very stringent target is a possibility, it dominates the solution; if deep reductions are not started as soon as possible, the target may become unreachable. However, reaching the stringent target comes at an exceedingly high price, indicating that e.g. adaptation measures, or even climate damages, might be preferable to the very high mitigation costs this target suggests.

**Keywords**. Climate change, energy systems modelling, carbon capture and storage (CCS), uncertainty