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Uncertainty in key abatement technologies: A sensitivity analysis for the CGE model DART

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Many cost estimates and scenarios for possible future energy systems rely on assumptions of technological development in key technologies, which today still play only a minor role or are at its infancy. Technologies such as carbon capture and storage (CCS) or renewable energy generation are however expected to become more competitive in the future and are therefore often assumed to play a major role for CO_2 abatement. Traditional scenario analysis to estimate economic costs of carbon abatement usually does sensitivity analysis with binary assumptions of technologies, i.e. technologies being either available at a deterministic cost estimate or completely unavailable. Here, we propose a more refined analysis with the general equilibrium energy-economy model DART. In a first step, the distribution of technological variables used as input parameters for the model (such as the cost markup compared to current technologies and learning rates) is obtained from a literature review. Based on this, we are able to attach probabilities to certain values of parameters that describe the key technologies, thus also allowing us to also obtain a distribution of outcome variables of interest such as welfare losses due to carbon abatement. Implementation in the model is carried out by applying a Gauss quadrature method.

The results are expected to deliver estimations variations in economic impacts due to uncertainty in different key technologies. We are particularly interested in the interaction and and potentially adding up effects of uncertainties in different technologies. The results would also help determining a ranking of different uncertainties in energy-economy as it is possibilities to compare the results of technological uncertainty with other sources uncertainty of exogenous economic parameters in the model.