Emission Performance Standards and EU Emission Trading Scheme - modeling uncertainties in policy measures (to be submitted).

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Abstract. Successful implementation of policy measures for tackling climate change depends on political commitment and long term commitment. In practice, the case seems often to be the opposite, weak political commitment and uncertainty with respect to which policy measures will be implemented and if there will be conflict between several measures. The latter is in focus of this paper which studies possible conflicts between the EU Emission Trading Scheme (EU-ETS) and Emission Performance Standards (EPS), based on a techno-economic energy systems modelling exercise. EPS have from time to time been proposed as a possible additional policy measure to reduce CO2 emissions from European power generation. EPS is in this context defined as emission restrictions on a power plant level, i.e. net CO2 emissions are given fixed limits per unit of power produced in the plant. Introduction of EPS is intended to govern the choice of power plant technology to less carbon intensive alternatives. As an example an EPS level of 350 gCO2/KWh would only allow natural gas fired power plants and, thus, coal plants can only be built once CCS is available. Yet, formal proposals on how such a policy would be formulated have not been presented by EU authorities, which obviously lead to uncertainty and worries among stakeholders such as those in the utility industry. This paper explores how the European electricity supply system can develop over time up to the year 2050 and how possible introductions of different EPS policies would interplay with the European Emission Trading Scheme (EU-ETS).

The analysis is based on modelling scenarios with the aid of the techno-economic model ELIN (cf. Energy Policy 37, 2009, pp1660–1677) with the objective of finding cost-efficient investment strategies within the electricity supply system. Special emphasis is put on including the influence of the present electricity generation system, considering timing of new investments and technology choices when meeting stringent CO2 reduction targets. Thus, the existing capital stock (power plants) is included in the model through application of a detailed database, the Chalmers Energy Infrastructure Database (cf. Energy Policy 35, 2007, pp3643-3664), providing information on present and planned power plants down to block level (e.g. fuel type, capacity and age structure). This makes the model well suited for assessing scenarios including EPS also on existing power plants. Assuming technical lifetimes for the power plants in the database gives residual capacities remaining over the period studied, which together with new investments meet projected electricity demand. New investment options are aggregated into technology classes (e.g. hard coal condensing power and onshore wind power). The assessment is performed with an EU-27 geographical scope, yet with an individual representation of each member state in the modelling. The analysis includes scenarios with and without inclusion of EPS as well as inclusion of fully integrated

markets for electricity, CO2 emission allowances and a joint European effort to meet the targets for renewables.

The results indicate that technology options at hand and efficiency measures provide the means to reduce CO2 emissions from power generation in line with what is required to meet established EU targets for the year 2020 without any introduction of EPS. Introduction of EPS will limit technology options for new investments, and thus lead to increased system cost compared to if the same emission reductions are met by EU-ETS as the only policy measure (possible combined with renewable targets). Furthermore, EPS will increase the dependency on natural gas as a fuel until CCS become commercially available, which can be problematic from a security of supply point of view. Introduction of EPS on existing power plants results in premature retirement in terms of technical lifetimes with the consequence of an intensive replacement period around the year of such EPS introduction. In all, application of EPS in parallel to EU ETS can disturb the carbon market and result in low (or even zero) prices on CO2 in the trading scheme. Yet, experiences show strong local opposition to new coal plants and, thus, in reality it may be difficult to build new coal plants even without the introduction of EPS.