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P3.222 Impact of external costs on the penetration of fusion power plants in the future global electricity system

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Externalities are defined as a cost that arises when the social or economic activities of one group of persons have an impact on another group and when that impact is not fully accounted, or compensated for, by the first group (ExternE project). External costs are not usually considered in the total cost of electricity causing market failures. To fairly compare the different electricity generation technologies in terms of costs and benefits, externalities should be included when estimating the total costs per kWh produced. In this work, a comparison among the external costs of the electricity generation technologies, including fusion, is presented. Then, those costs have been introduced into the EUROfusion Times Model (ETM) to analyse their impact on the global electricity system evolution in the long term with special focus on the penetration of fusion technologies. ETM is a global optimization energy model developed within the framework of the Socio Economic Studies project (SES) in EUROfusion, which provides the optimum energy system at minimum cost and maximum social welfare and sustainability.
In a first step, four scenarios have been formulated and represented by ETM. A Reference scenario, and a Policy scenario which represent a highly electrified global system, both with and without external costs. Results show that when external costs are included in the total costs of electricity, fusion technologies become more competitive as their associated externalities are in the range of some renewable and nuclear fission technologies in contrast to those from the fossil fuel technologies.

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