

ARBITRAGE BETWEEN ENERGY EFFICIENCY AND CARBON MANAGEMENT

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ABSTRACT

With the rise of energy prices and the development of carbon markets, energy efficiency and carbon emissions are two key decision variables for industrial actors. Those two variables are closely related, but the following question remains open: does better efficiency systematically implies less carbon emissions? This is not a general rule: if we consider for instance, a nuclear power plant, it has a low carbon footprint but can be poorly efficient. The future development of Carbon Capture and Sequestration (CCS) technology will break even more this correlation. Thus, carbon management and energy efficiency management are different business models. The goal of this study is to evaluate the arbitrage between carbon and energy efficiency management for industrial actors.

The study relies on the TIAM-FR model, which is a 15-region world version of the MARKAL/TIMES model family. It is a bottom-up E3 (Energy – Environment – Economy) model which optimizes energy systems under constraints by using a partial equilibrium. This model is used for mid-term to long-term (e.g. 2050 time horizon) energy and carbon prospective.

In order to compare energy efficiency and carbon policies, we implemented an extension which gives access to the primary equivalent and carbon content of each energy vector (and their evolution through time for each region). Questions about the different primary energy definitions and the counting of carbon emissions are also discussed. Primary equivalent and carbon content of commodities will depend on various scenarios (climate policies, processes availability, costs of technologies, demands, etc). Those results allow us to assess the arbitrage between energy efficiency and carbon management. What are the conditions to turn an efficiency-driven business to a carbon-driven business?

References

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