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Long-term modelling and assessment of the energy-economy decoupling in Spain

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Abstract

Over the past few years, a decoupling effect between economic growth and energy consumption has been detected in many countries. Albeit this fact may be understood as positive, it supposes a concern for energy systems modellers since assumption-making process, especially concerning the linkage of the socio-economic drivers with energy demand, cannot be founded on simplistic relationships any longer. Accordingly, this article develops a double assessment to solve that problem. It proposes the use of econometric models as suitable tools to project the electricity demand in Spain, and besides, it introduces those refined energy demand projections as input for the Spanish energy system model, created using the LEAP framework. The results show substantial deviations (up to 18% by 2050) in the electricity production required and, to some extent, such divergences involve changes in the electricity production technology mix. Besides, from the electricity demand side, the use of refined demand projections has a significant effect on the sectoral behaviour, proving that—with respect to a simplistic set of projections—industry demand is overestimated, whereas residential demand is undervalued. In summary, due to the existence of a decoupling effect, energy systems modellers should avoid making simplistic assumptions when taking exogenous demand projections.

Keywords

Decoupling; Demand projection; Econometric model; Energy systems; Energy model; LEAP

1. Introduction

In the recent years, the European Union has developed important initiatives focused on the supply side of the energy system which aims at increasing efficiency, diminishing energy demand, and decoupling energy consumption from economic growth [1]. Among all these measures, the promotion of energy labelling schemes in residential sectors (domestic appliances, for instance), financial incentives to co-generation processes, and energy efficiency in buildings, both for existing and new designs, are significantly relevant.

Energy Systems Models (ESM) are useful tools to design energy plans and assist policymakers in decision-making processes. Those tools, ESM, are founded on scenario narratives, rationales which usually answer ‘what if’ questions regarding
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