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# Socio-Economic Planning Sciences

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## Editorial

## Preface to the special issue on energy modeling

Energy modeling is an active field of research that combines contributions from various disciplines, including economics, engineering, operations research, and public policy. The current energy landscape, in the United States as well as other countries, features a mix of market competition and government regulation. This special issue of Socioeconomic Planning Sciences contains three papers that together present novel and relevant energy modeling research emphasizing this important interplay. Below, we briefly highlight the key contribution of each of these papers, in the order in which they appear.

In "Estimating the Impact of Fuel-Switching between Liquid Fuels and Electricity under Electricity Sector Carbon-Pricing Schemes," Jon Dowds, Paul Hines, and Seth Blumsack model and estimate the combined impacts of changes in demand levels and patterns in the presence of likely climate change mitigation policies on electricity prices and increasing penetration of variable renewable energy sources. Using a one-year least cost generation expansion/bid-based generation dispatch model calibrated to data, these authors show that there is significant potential for CO<sub>2</sub> reductions in the electricity sector even while meeting increased demand from fuel switching due to electric vehicle charging. These emissions reductions can be achieved most economically if consumers are able to respond to higher electricity prices through demand side market response measures. The absolute cost of emissions reductions and fuel switching highly depends on the cost of lower carbon generating options, specifically natural gas prices and wind capital costs.

Peter Balash, Christopher Nichols, and Nadejda Victor in "Multi-Regional Evaluation of the U.S. Electricity Sector under Technology and Policy Uncertainties: Findings from MARKAL EPA9rUS Modeling" examine the uncertainties inherent in regulations affecting electric power generation in the USA. They use regional results from the Environmental Protection Agency's MARKAL (Market Allocation) model to examine how command-and-control regulations and market-based environmental policies could change the mix of fuels used for electricity generation, the amount of CO<sub>2</sub> emissions, and the cost of electricity regionally in the USA. Price in-

creases are predicted to be quite different regionally, with consequent heterogeneous effects on preferences for environmental regulatory policy.

In "An Analysis of Eco-Efficiency in Energy Use and CO<sub>2</sub> Emissions in the Swedish Service Industries", Clara Inés Pardo Martínez presents results of a panel data set analysis of 15 years of empirical data on the energy efficiency of the service sector in Sweden. The analysis indicates that taxes on energy and labor productivity both have statistically significant effects on energy (and carbon dioxide emission) intensities. The Swedish fuel, electricity, and CO<sub>2</sub> taxes (all linked to the Swedish consumer price index to give a constant real tax rate) are found to reduce energy use and CO<sub>2</sub> emissions modestly (due to the low fraction of total costs that energy represents in the service sector). Service industries with higher labor productivity are found to have significantly higher energy efficiency.

We wish to thank the Editor-in-chief Vedat Verter for inviting and encouraging us to edit this special issue. We thank the authors of the published papers and of all the other papers we received for submitting their research to this special issue, as well as the reviewers of all these papers for their time spent in evaluating these submissions and the constructive feedback they offered to authors. We would like to acknowledge the contribution of the late Paul Kleindorfer in motivating and setting the direction for this special issue. We know that his advice to the Editor-in-chief during the planning phase has been invaluable.

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