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Agent-Based Modeling as a Support to an Expert-Based Approach: Exploring Individual Heating Systems Transition

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Abstract

Expert-based energy scenarios are mainly developed following assumptions of experts and, in most cases, a limited number of stakeholders. Such an approach will provide satisfactory results in centrally managed energy sectors where further decisions could be envisaged relatively precisely (electricity production/distribution, district heating systems, etc.). The same approach will provide more uncertain outcomes of future energy structure in the household sector, where decisions related to consumption, selection of energy source, or application of specific technology are made by numerous individuals. Besides prices, the decisions of individuals are influenced by their attitudes, social environment, incentive measures, etc. The influence of consumer behavior and attitudes on decision-making can be examined using the agent-based simulation model. The output of this simulation model is the structure of energy consumption in the analyzed period. Such data can be further used as one of the main assumptions in scenario development in an expert-based energy model. The objective of this paper is to propose a new approach to energy modeling, in which the result from the agent-based simulation model would serve as an input in the expert-based modeling process. The obtained model integrates expert knowledge with the results of the bottom-up modeling approach. This approach allows early assessment of the effects of supporting measures and mechanisms for accelerating the energy transition of a large number of individuals. The new approach is applied and tested in the development of a simulation model of energy transition of individual households' heating systems in Serbia.