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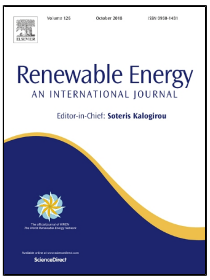

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ABSTRACT

Selecting a renewable energy source portfolio is an uncertain multi-criteria decision-making (MCDM) problem. In particular, it involves searching for the best portfolio of renewable energy that meets the decision maker's preferences by considering and leveraging conflicting criteria such as technical, environmental, societal, and economic. To tackle such complex problems, this paper proposes an efficient method, called multi-segment fuzzy goal programming (MS-FGP), which addresses decision-making problems with high levels of uncertainty. The paper makes the following contributions: i) extends the conventional fuzzy goal programming (FGP) model to solve a wide range of uncertainties decision-making problems and ii) proposes a method based on a recent development in the FGP area that considers all types of fuzzy goals in real-world problems. The model is validated by applying it to a real-world scenario: optimizing the renewable portfolio for electricity generation in Italy. These renewables are solar photovoltaic (PV), wind, biomass, and tidal currents. The results show that the proposed methodology can assist decision makers in determining the most sustainable renewable energy source portfolio for electricity generation under uncertain conditions and in imprecise environments.

Keywords: multi-criteria decision-making; multi-segment fuzzy goal programming; renewable energy planning.

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