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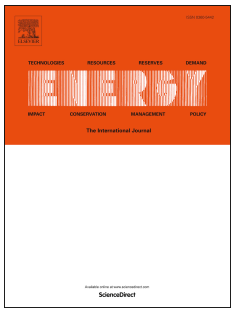

Time-series aggregation for synthesis problems by bounding error in the objective function

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Time-series aggregation for synthesis problems by bounding error in the objective function

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Abstract

The complexity of synthesis problems for energy systems is commonly reduced by time-series aggregation. The accuracy of time-series aggregation is commonly measured by the capability of the aggregated time series to represent the full time series. However, this accuracy measure is not linked to the goal of the synthesis problem: to make the right investment decisions. In this work, we propose a method to bound the error of time-series aggregation by measuring the accuracy of the aggregation in the domain of the objective function: For each design, the error is calculated between the cost considering the aggregated time series and the full time series. An adaptive procedure determines the aggregated time series required to accurately represent the costs of the full time series. Feasibility time steps are also identified to ensure security of supply. Results of a case study on the synthesis of an energy supply system show that aggregation to less than 10 time steps is sufficient to represent the full time series with excellent accuracy.

Keywords: time-series aggregation, accuracy measure and error bound, k-means clustering, synthesis optimization, energy system, renewable energies

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