

Master's Thesis

Analysis of marginal cost-based time series aggregation for energy system modeling



Motivation

Optimization models for large-scale energy systems are computationally intensive and can become intractable at high resolutions. Time Series Aggregation (TSA) is commonly used to reduce temporal complexity, typically by clustering input data based on statistical features. However, accurately representing the input data does not necessarily ensure accurate model outcomes.

Recent work shows that aggregating time steps with identical marginal costs, i.e., dual variables of the power balance, can reduce model size while preserving accuracy. Yet, further aggregation based on marginal costs often leads to a rapid loss of solution quality. This motivates further investigation into marginal cost-based aggregation to understand and mitigate this deterioration, enabling more efficient model reduction without decreasing accuracy.


RESEARCH QUESTIONS


- How to estimate the error coming from aggregating together time steps with different values of marginal costs?
- How to efficiently predict marginal costs without need of full-scale solution knowledge?
- How it influences the error in investment decisions?

TASKS & METHODOLOGY


- Literature research on existing methods/models
- Data research, preparation and analysis
- Modeling in Python (Pyomo)
- Optimization and aggregation of energy system models
- Analysis of the results
- Presentation of the results


ORGANIZATIONAL INFORMATION


 Start: Immediately

 Support from the motivated IEE team

 Close cooperation with supervisor

 Modern workstations available at the institute

 (Partial) creation in home-office possible

 Writing in English

Contact

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