Master's Thesis

Bridging Data Gaps for the Optimization of Sector-Coupled & Sustainable Energy Systems

Picture by American Public Power Association on Unsplash

Motivation

Modeling, designing & optimizing sector-coupled energy systems is one of the current challenges on our path to achieving the climate goals we have set for the coming years. On top of the mathematical modeling of those energy systems, data availability is also a tough challenge for research and industry alike. Some data points are not allowed to be shared because of data protection concerns; other data points are simply not yet captured in the quality those models would require (e.g., regarding temporal resolution). This is where this Master's Thesis wants to close some gaps between available and required data sets.

The goal is to extend an existing time series generation tool by adding modules for electricity and heating time series. Applying state-of-the-art methods from current literature, the generator should leverage existing data to generate relevant datapoints. Examples: Using water levels to estimate hydro-power generation, transforming solar radiation to photovoltaic capacity factors or translating wind speeds to wind capacity factors.

RESEARCH QUESTIONS

- How to generate realistic input time series (e.g., electricity demand, heating demand, …) from limited available data to correctly model energy systems?

- How to calibrate and verify time series using available data (e.g., historical demand)?

- How does data quality for those time series affect electricity model output quality (sensitivity analysis)?

- How to incorporate open-source data to increase data quality?

TASKS & METHODOLOGY

- Literature research on existing methods and models to generate time series

- Data research, preparation and analysis

- Generation, calibration and testing of example time series

- Programming in Python, adding additional modules for (renewable) capacity factors and/or demand to an existing data generation framework

- Analysis and presentation of 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

Dipl.-Ing. Felix Auer
felix.auer@tugraz.at
+43 316 / 873 7913

Institute of Electricity Economics
and Energy Innovation
▶ iee.tugraz.at