

Techno-economic (on-the-fly) analysis documentation

The provided Python script performs a techno-economic analysis for a photovoltaic (PV) system. The analysis includes the calculation of self-consumption, self-sufficiency, yearly savings, earnings from sold energy, total yearly earnings, and return on investment (ROI). The analysis is based on given parameters such as location, PV system specifications, consumption type, yearly consumption, and cost-related factors.

Functions

get_pv

This function retrieves PV data from the PVGIS API based on the given latitude, longitude, roof tilt, azimuth, and nominal power. It saves the data to a CSV file and returns the generated power values.

get_consumption_profile_from_database

This function selects a consumption profile from the database based on the consumption type selected by the user.

get_self_consumption_profile

This function calculates the element-wise self-consumed energy and sold energy based on the given consumption and generation profiles.

calculate_roi

This function calculates the return on investment (ROI) based on the initial investment and the sum of yearly earnings.

techno_economic_analysis

This is the main function that performs the techno-economic analysis. It combines the results from the PV data retrieval, consumption profile generation, self-consumption calculation, and ROI calculation.

Input Parameters

Location:

- latitude: Latitude of the building.
- longitude: Longitude of the building.

PV System Specifications:

- nominal_power: Nominal power of the PV system.
- roof_tilt: Tilt angle of the PV system.
- roof_orientation: Azimuth angle of the PV system.
- yearly_pv_generation_per_kWp: Average energy yield per unit nominal power.

Consumption Information:

- consumption_type: Type of energy consumption (e.g., residential, commercial, ...).
- yearly_consumption: Total yearly energy consumption.

Cost-Related Factors:

- cost_of_electricity: Cost of electricity per kWh.

- value_of_sold_electricity: Value of sold electricity per kWh.
- cost_of_PV: Cost of the PV system per unit nominal power.

Output Results

- self_consumption [%]: Percentage of self-consumed energy.
- self_sufficiency [%]: Percentage of self-sufficient energy.
- yearly_generation [kWh]: Total yearly energy generation.
- yearly_savings [€]: Yearly savings from self-consumed energy.
- yearly_earnings_sold [€]: Yearly earnings from sold energy.
- total_yearly_earnings [€]: Total yearly earnings.
- roi [%]: Return on investment as a percentage.