Introducing POMMES

A cosmos for modelling the German power sector using oemof.solph

pommesdata | pommesdispatch | pommesinvest
pommesdata
A full-featured transparent data preparation routine from raw data to POMMES model inputs

Overview

https://github.com/pommes-public/pommesdata

- **Aim**
  - Prepare data for pommesdispatch or pommesinvest
  - Dispatch: historical 2017-2021; projections until 2030
  - Investment: 2020-2045 (development)

- **Main data sources**
  - OPSD, BNetzA, FRESNA, ENTSO-E for power plants
  - BNetzA: tenders; ÜNB: Stamm- & Bewegungsdaten for RES
  - DESTATIS, BMWK, ISE, IEA, PIK et al. for costs

- **Main assumptions / estimates**
  - Efficiencies (DIW), minimum loads (demand regio + historical)
  - Future power plant development (TYNDP, BDEW, ISE)

Strengths / Weak Spots

- **Strengths**
  - Full transparency from raw data to model inputs
  - Near-term future power plant development
  - High detail for RES (& demand response; other scripts)

- **Weak spots**
  - Maintainance / maintainability
  - Time series data so far based only on 2017

Raw data → jupyter

data_prep.ipynb

POMMES inputs
### pommesdispatch

*A bottom-up fundamental model for the German electricity sector*

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#### Overview

**https://github.com/pommes-public/pommesdispatch**  

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial coverage</td>
<td>• DE + electrical neighbours (NTC approach)</td>
</tr>
<tr>
<td></td>
<td>• Spatial resolution: bidding zones</td>
</tr>
<tr>
<td>Time</td>
<td>• Typically one year in hourly resolution</td>
</tr>
<tr>
<td></td>
<td>• Run time on desktop machine ~2 hours</td>
</tr>
<tr>
<td>Implementation</td>
<td>• Optimization using oemof.solph</td>
</tr>
<tr>
<td></td>
<td>• Data management using pandas / .csv</td>
</tr>
</tbody>
</table>

#### Strengths / Weak Spots

**Strengths**

- detailed RES & power sector modelling  
- well-tested (coverage > 90 %) & well documented  
- pip installable & executable from console  
- easily configurable via .yaml config file

**Weak spots**

- No spatial resolution & missing some European countries  
- No unit commitment
**pommesinvest**

A bottom-up fundamental investment model for the German electricity sector

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**Overview**

- https://github.com/pommes-public/pommesinvest

**In short**

- Determine power sector investments from 2020 to 2045
- Exogenous RES development (EEG 2023)
- Determine annual investments in power plants, storages and demand response
- Building on recent scenario data (Ariadne & Prognos)

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**Strengths / Weak Spots**

**Strengths**

- Multi-period modelling approach + „classical” myopic horizon alternative
- Investments in all relevant power sector flexibility options (power plants, storage, demand response)
- (will also be) tested, pip installable, documented etc.

**Weak spots**

- Still under development
- Germany only; No endogenous RES investments
pommesevaluation
An evolving collection of ex post analyses for POMMES
Contact

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Introducing POMMES

BACKUP
pommesdispatch – RES in the market premium scheme

*Depicting RES opportunity costs to simulate negative prices*

- **Background**
  - Modelling RES at 0 costs not sufficient
  - Consequence: no negative prices

- **Approach**
  - Empirical evaluation of RES values applicable using the „EEG-Bewegungsdaten“ from the German TSOs
  - Assumption: RES in the market premium model bid at (opportunity) costs* of 
    \[ -VA + E[MV] \]
  - Clustering RES by AW and type to reduce complexity and model negative price steps
  - One residual cluster for all RES in FIT

\( VA \): Value to be applied

\( E[MV] \): Expectation of market value; historical or estimate from previous iterations

RES: PV, Wind onshore / offshore

POMMES – power sector modelling | J. Kochems, Y. Werner, J. Giehl, B. Grosse et al.
18/05/2022
Problem
- Units are clustered
- → Approach for handling different lifetimes within cluster needed

Grouping of units
- Exogenous decommissioning or commissioning
- Endogenous investments

Approach for exogenous developments
- Determine likely commission / decommission date
- Decommissionings: Force min and max output of plant to zero if it will be decommissioned by decreasing min / max output
- Commissionings: Increase min / max output of cluster and add exogenous (investment-related) costs term in pos processing

<table>
<thead>
<tr>
<th>label</th>
<th>year</th>
<th>min_load_factor</th>
<th>max_load_factor</th>
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<tbody>
<tr>
<td>old_coal_cluster_1</td>
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<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td>old_coal_cluster_1</td>
<td>2025</td>
<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td>old_coal_cluster_1</td>
<td>2030</td>
<td>0.1</td>
<td>0.9</td>
</tr>
</tbody>
</table>

plant going offline accounted for 10% of overall cluster capacity