Strommarkttreffen „Batterien“

System effects of cheaper batteries: a model comparison

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Open Source Energiewende

• Ongoing BMWi project Open Source Energiewende
  • Lead by NEON, together with, , ETH Zürich
  • Specific working package: open-source model comparison

• Topic of model comparison
  • Effect of cheaper battery storage in European 2030 scenarios
Participating power sector models

- Dispatch and investment models
  - Calliope (ETH Zürich)
  - DIETER (DIW Berlin)
  - dynELMOD (TU Berlin)
  - EMMA (Neon)
  - OSeMOSYS (KTH Stockholm)
  - PLEXOS Open EU (University College Cork)
  - urbs (TU München)

- Pure dispatch models
  - Dispa-SET (JRC)
  - oemof / de21 (RLI)

→ Different features, different geographic coverage

Work in progress → we present selected preliminary results today
Input data

- Limited funding: no full harmonization of inputs
  → Focus on comparison against model-own baseline

- Main inputs
  - Time series: OPSD
  - Capacity data: Entso-E TYNDP ST + German NEP
    - Upper bound for conventional, lower bound for RES, PHS fixed
  - Minimum RES constraints, CO₂ cap
  - Baseline battery cost assumptions based on Schmidt et al. (2017)

<table>
<thead>
<tr>
<th></th>
<th>unit</th>
<th>value</th>
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<tbody>
<tr>
<td>Investment power</td>
<td>€/kW</td>
<td>135.14</td>
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<tr>
<td>Investment energy</td>
<td>€/kWh</td>
<td>315.32</td>
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<tr>
<td>Lifetime</td>
<td>years</td>
<td>12</td>
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<tr>
<td>Roundtrip efficiency</td>
<td>-</td>
<td>0.92</td>
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Sensitivities with 50% or 25% of baseline cost assumptions
Results for Germany
Battery capacity

Relatively low for baseline costs, more substantial for 25% cost sensitivity
Dispatch effects relative to respective model baseline

Non-robust, driven by cost assumptions
Effect on carbon emissions relative to respective model baseline

Carbon emissions vs. Baseline - Germany only

Cheap flexibility may increase emissions
Results for European models
→ Qualitatively similar as for „Germany only“
Battery capacity by country – 25% cost sensitivity

Strongly non-robust
Dispatch effects relative to respective model baseline

Qualitatively more robust than for Germany only
Effect on carbon emissions relative to respective model baseline

Carbon emissions vs. Baseline - Europe

Now always decreasing
• Preliminary conclusions so far
  • „Non-robustness“ driven by
    • cost assumptions
    • geographic coverage
    • reservoir modeling
  • Cheaper batteries not a major game changer in 2030 scenario
  • Even less so if Germany is not modeled in isolation

• Next steps
  • Additional model results
  • Further exploration of drivers → being open helps!
  • Investigate effects of sector coupling
Vielen Dank für Ihre Aufmerksamkeit.