DEMAND RESPONSE POTENTIAL OF ELECTRICAL HEAT PUMPS AND ELECTRIC STORAGE HEATERS

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Research Center for Energy Economics

- Independent Research in Energy Economics for 60 years
- Cooperation with the Technische Universität München
  - Expertise in all fields of energy economics
  - Foundation of Research Association for Energy Markets and Technologies in 2001

Research Association for Energy Markets and Technologies

- Smart Energy & Smart Markets
- Industrial Energy Management
- Urban Energy Management
1. **Challenge and Motivation**
2. Data Input
3. Methodology
4. Results
5. Conclusion
Challenge and Motivation

Flexible Loads

50 Hz

source: Verstege
Agenda

1. Challenge and Motivation
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Data Collection

Service Territory
- EnBW
- E.ON
- LEW
Electricity Consumption of Electric Storage Heaters and Heat Pumps
Agenda

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Temperature-dependent load profiles

Heat Pumps

Electric Storage Heaters
Aggregate temperature-dependent Load Profiles

Load [MW] vs. Time for different temperatures:
- **-10°C**
- **0°C**
- **10°C**

The graphs show the load profiles for electric storage heaters and electrical heat pumps at different times of the day for each temperature condition.
Frequency of Reference-Temperatures and Variation of Load

- Daily mean value of the temperature-dependent load profile of ESH (BY and BW)
- Daily mean value of the temperature-dependent load profile of HP (BY and BW)

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Agenda

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Load Reduction Potential of Heat Pumps in Bavaria and Baden-Wuerttemberg
Load Reduction Potential of Electric Storage Heaters in Bavaria and Baden-Wuerttemberg – Methods 1 & 3
Load Reduction Potential of Electric Storage Heaters in Bavaria and Baden-Wuerttemberg – Method 2
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Summary and Conclusion

- Maximum Potential up to 3,000 MW for one hour at 0°C (ESH & HP)

- Available Load Shifting Potentials are highly dependent on
  - The Outside Temperature and
  - The Time of Day

- Regulatory Barriers prohibit Participation in Energy Markets

<table>
<thead>
<tr>
<th></th>
<th>Method 1</th>
<th>Method 2</th>
<th>Method 3</th>
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<tbody>
<tr>
<td>Realizable with installed control- and communication technology</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New control- and communication technology necessary</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Previous planning required prior to activation</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Spontaneous activation without previous planning possible</td>
<td></td>
<td></td>
<td>X</td>
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Thank you for your attention

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