From Theory to Action: Sector Coupling and Decarbonising the District Heating of Vienna

Karl Gruber, Managing Director Wien Energie GmbH
Vision 2050 – Decarbonising District Energy For Our Cities
Brussels, 01.10.2019
Paris Agreement – Full Decarbonisation by 2050
Wien Energie Study – Decarbonising the City of Vienna by 2050

- Two Scenarios for 2050:
  - ✓ 80% Decarbonisation („Smart City Scenario“)
  - ✓ 100% Decarbonisation
- Key findings:

<table>
<thead>
<tr>
<th></th>
<th>„Smart City 2050“</th>
<th>DECARB 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td>58% Building Refurbishment</td>
<td>100% Building Refurbishment</td>
</tr>
<tr>
<td>Mobility</td>
<td>45% E-Mobility</td>
<td>100% E-Mobility</td>
</tr>
<tr>
<td>Electricity</td>
<td>100% Renewable</td>
<td>100% Renewable</td>
</tr>
<tr>
<td>Investment</td>
<td>16 Mrd. EUR</td>
<td>28 Mrd. EUR</td>
</tr>
</tbody>
</table>

www.wienenergie.at/studie2050
## Energy Transition = Sector Integration of Electricity + Heat + Mobility

<table>
<thead>
<tr>
<th>Energy Transition</th>
<th>Vienna (2015)</th>
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</thead>
<tbody>
<tr>
<td>=</td>
<td></td>
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<tr>
<td>Electricity</td>
<td>~8 TWh</td>
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<tr>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Heating*</td>
<td>~15 TWh</td>
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<tr>
<td>+</td>
<td></td>
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<tr>
<td>Mobility</td>
<td>~13 TWh</td>
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*Heating and Warm Water (excl. Electricity)

### Share of Renewable Energy

- **Electricity**: 63%
- **Heating**: 13%
- **Mobility**: 8%
Active Management of the DHC System as Heat Storage for the Integrated Energy System

- „Power Shift“ → Use of DHC infrastructure for storing heat
- „Power Drop“ → Capping of load peaks
- Lowering of temperatures for efficient integration of low-temperature producers, such as geothermal or heat pumps
Power2Heat: Heat Pump and Electric Boiler

Largest Heat Pump of Central Europe

- Integration of 27MWth heat pump at the largest power plant site of Vienna (1 GWth thermal power)
- Heat sources are the cooling system of the power plant and the adjacent river („Donaukanal“)

Electric Boiler

- 2 electrodes à 10 MW (operational reliability)
- Water temperature >160°C
- Quick availability; <10 Min. from zero to 20MW
- Participate in the electricity balancing market
- Reserve capacity for the DHC system
Cogeneration and Solar Thermal Energy

• Cogeneration power plants of „Wien Energy“ supply almost 50% of the electricity produced by thermal power plants in Austria on cold, windless winter nights i.e. 1.800MWel + 1.500MWth
• Cogeneration sites are also uses for renewable energy production
• E.g. solar thermal heat production at the largest site („Simmering“)
  ✓ 700m², 1MW
  ✓ Feeding 65°C water into the DHC
Buildings with Autonomous Power Supply – „GreenHouse“ Student Residency

- Dramatically lower energy consumption (total energy consumption incl. all household appliances, consumer electronics, etc. <45kWh per m²)
- Production of renewable energy >60kWh per m²
- Energy Storage within the building
Decarbonisation is Feasible in Practice

- All elements for energy transition are available
- There is no reason to postpone the decarbonisation of our DHC systems

→ Let’s do it!
Thank you for your attention!

Karl Gruber
Managing Director Wien Energie

karl.gruber@wienenergie.at
Heat: Share of Energy Sources in Vienna 2015 and 2050 (TWh)

- Oil and Gas Heating
- Electricity
- "Green" Gas
- District Heating
- Biomass
- Environment Heat

2015:
- Oil and Gas Heating: 8.0 TWh
- Electricity: 6.3 TWh
- "Green" Gas: 0.9 TWh

DACARB 2050:
- Geothermal: 36%
- Waste Incineration: 35%
- Heat Pumps: 19%
- Rest: 10% (Waste Heat, Biomass, Cogeneration, etc.)
Geothermal

- Potential for geothermal heat in Austria approx. 700MWth
- Significant share of this potential lies in and around Vienna