Combined solar and HP systems respond to policy goals and can appeal to end user

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• Sales of hydronic heat pumps in Europe and the shift towards DHW HPs

• Decarbonised electricity is both: advantage and obstacle for HPs

• Combined solar and HP systems can help reduce CO2 emissions in existing homes

• Support needed to maintain the value proposition of combined systems in the long term

• Technology development and policy making need to meet with end user acceptance to propel heat pumps to the main stream
Heat pumps historic growth in Europe

Sales of hydronic heat pumps Europe, units, 2006 – 2016

Source: BSRIA based on data from 21 European countries
Legislative push meets consumer resistance

European Legislation

europa.eu

National Building Regulations

Incentive programs

Electricity Rates Increase

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Uneven growth in energy prices

Electricity price between 2006 and 2016

- Germany: Up 47%
- France: Up 41%

Gas price between 2006 and 2016

- Germany: Up 10%
- France: Up 3%

Special tax on electricity in Germany and France

<table>
<thead>
<tr>
<th>Year</th>
<th>EEG Umlage value (Germany)</th>
<th>CSPE value (France)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>0.15€/kWh</td>
<td>0.30€/kWh</td>
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<tr>
<td>2011</td>
<td>0.75€/kWh</td>
<td>0.30€/kWh</td>
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<tr>
<td>2014</td>
<td>7.00€/kWh</td>
<td>1.50€/kWh</td>
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<tr>
<td>2015</td>
<td>6.50€/kWh</td>
<td>2.00€/kWh</td>
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<tr>
<td>2016</td>
<td>7.00€/kWh</td>
<td>2.50€/kWh</td>
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Sales of hydronic heat pumps in Germany and France against the electricity / gas price ratio, units, 2006 – 2016

Source: BSRIA based on data from 21 European countries
Spark = ratio between the price of electricity and gas for residential end user
Slow progression of heating HPs

Growth of hydronic HPs in Europe and share of DHP Heat Pumps, 2009 - 2016

Source: BSRIA based on data from 21 European countries
Share of HP installations in New and Existing buildings in Europe

2009

- New build: 56%
- Existing buildings: 44%

2016

- New build: 65%
- Existing buildings: 35%

Source: BSRIA based on data from 21 European countries
Decarbonised electricity gives HP advantage

Level of CO₂ emissions for households fitted with either A/W heat pump or gas condensing boiler in Germany and France

- Existing dwelling with HP in Germany
- Existing dwelling with HP in France
- Existing dwelling with gas CB

Kg CO₂/year

Source: BSRIA
Combined HP and PV installation lowers the energy cost for consumer

Yearly energy cost for a dwelling with Air to Water HP stand alone and combined with PV system (existing dwellings, € / year )

Source: BSRIA
Combined HP and PV installation substantial in markets where spark is high

**European HP market by type of installation, 2016**

- Standalone installation: 78%
- Installed with fossil fuel boiler: 3%
- Installed with solar thermals: 2%
- Installed with biomass (boilers/stoves): 4%
- Installed with solar photovoltaic: 17%

**Most important markets for combined HP/PV installations, 2016**

- Germany: 49%
- Italy: 16%
- Austria: 13%
- France: 8%
- Belgium: 9%
- Others: 5%

Total number of combined HP/PV systems: ~ 21,000

Source: BSRIA based on data from 21 European countries

Spark = ratio between the price of electricity and gas for residential end user
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Reinforced value proposition is needed for the future

Projected energy cost for a dwelling with heat pump in relation to electricity price and FiT*  
GERMANY

<table>
<thead>
<tr>
<th>Year</th>
<th>PV FiT/KW</th>
<th>price of electricity</th>
<th>energy cost with HP</th>
<th>energy cost with HP &amp; PV</th>
<th>energy cost with GCB</th>
<th>HP + PV (50% own use)</th>
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<tbody>
<tr>
<td>2012</td>
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<td>2016</td>
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<td>2020e</td>
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- FiT = feed-in-tariff  
- HP COP 3.5  
- Own use of generated electricity: 35%  

Electricity price CAGR: 2.6%  
Gas price CAGR: 1.2%*  

Source: BSRIA based on data from 21 European countries
Long term market drivers for Heat Pumps

- **Slow but ongoing with HPs being already used in smaller networks**
- **Storage batteries needed to support own consumption**
- **Requirements are becoming tighter**
- **Mostly related to new build might open up to renovation**
- **Building regulations**
- **Energy efficiency regulations for products**
- **PV & storage market development**
- **Smart grid development**

Timeline:
- 2010
- 2015
- 2020
- 2030

Source: BSRIA
• Heat pumps are growing but need stronger value proposition for end user to become real mainstream
  
  o *Is it enough to rejoice on growth of domestic hot water heat pumps only?*

• Combined HP and solar installations are attractive as low energy cost system and as a low carbon solution
  
  o *Is it enough to relay on legislation and government fiscal incentives to develop this market further?*

• Increased self consumption will support progress of combined HP/PV systems
  
  o *Is it possible to match consumer interests with those of energy providers?*
Thank you