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

Krystyna Dawson
Business manager WMI

May 2017
• Sales of hydronic heat pumps in Europe – what’s going on?

• Decarbonised electricity is both: advantage and threat 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

• Energy storage will gain importance and smart grid will act as a long term driver
Heat pumps dominating in Europe?
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

National Building Regulations

Incentive programs

Electricity Rates Increase

Making buildings better
BSRIA ©
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

€cent / kWh

- EEG Umlage value (Germany)
- CSPE value (France)
Increasing energy prices impact HP sales

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

Source: BSRIA based on data from 21 European countries
Installations in new buildings dominate today

Share of HP installations in New and Exiting buildings in Europe

- **2009**
  - 56% New build
  - 44% Existing buildings

- **2016**
  - 65% New build
  - 35% Existing buildings

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

Kg CO₂/year

existing dwelling with HP in Germany
existing dwelling with HP in France
existing dwelling with gas CB

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: 17%
- Installed with solar thermals: 3%
- Installed with biomass (boilers/stoves): 2%
- Installed with solar photovoltaic: 4%

Most important markets for combined HP/PV installations, 2016

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

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
Residential photovoltaic systems already well established

Estimated 4 million systems installed in 2014 / Installed capacity

- Italy: 26%
- Germany: 38%
- Belgium: 16%
- France: 9%
- Spain: 1%
- UK: 10%
Projected energy cost for a dwelling with heat pump in relation to electricity price and FiT*

**GERMANY**

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy cost €/year</th>
<th>FiT / electricity price €/cent/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>800</td>
<td>0.05</td>
</tr>
<tr>
<td>2016</td>
<td>1,200</td>
<td>0.06</td>
</tr>
<tr>
<td>2020e</td>
<td>1,600</td>
<td>0.07</td>
</tr>
</tbody>
</table>

- **PV FiT/KW**
- **Energy cost with HP**
- **Energy cost with HP & PV**
- **HP + PV (50% own use)**

*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

**Making buildings better**

BSRIA ©
Energy storage can be applied at different stages of the value chain:

**Production**
- Renewables
- Capacity firming
- Smoothing and Shaving
  - 1 – 10 MW

**Distribution**
- Load management
- Peak shaving
- Voltage control
  - 100kW – 1MW

**Transmission**
- Ancillary services
- Frequency control
  - 10 – 50 MW

**Consumption**
- Time shifting
- Local energy management
- Increase on-site renewables self-consumption
  - 5 – 50 kW
Advances in battery storage

- Battery storage has been seen as prohibitively expensive, but the cost is gradually decreasing.

- Lead and lithium batteries are now commercially available in Europe for c. €1,000 (or $1,200) per KwH.

- In April 2015 US electric car manufacturer Tesla launched Powerwall, - battery storage aimed at the residential market.
  - a7kWh unit for $3,000
  - a10kWh unit will retail for $3,500

- In June 2015, Mercedes launched a 2.5KwH home battery.
  - Up to 8 can be used in combination, providing 20KwH

- In November 2015 E.ON announced that it is concentrating on developing energy storage in residential and focusing on lithium-ion as it expects its cost to fall by about 50% in the next five years.

Batteries from both Tesla and Mercedes targeted at the residential market provide further evidence of technology moving into the built environment from elsewhere.
Push for development of battery storage

Penetration of electrical battery storage in Single residential dwellings, GERMANY

- 11,685,000, 88.0%: Homes Without Solar PV
- 1,566,000, 11.8%: Solav PV but no Electrical Storage
- 50,000, 0.3%: Solar PV + Electrical Storage

Making buildings better
BSRIA ©
Smart grid advances in the future
• Heat pumps are growing but rise in electricity prices undermine their competitiveness

• Combined HP and PV installations are attractive as low energy cost system and as a low carbon solution

• Electric storage and increased self consumption can offset gradual decrease in FiT and increase in electricity prices
Conclusions

• Heat pumps need stronger value proposition to become real mainstream

• Combined HP / PV and storage systems can engage consumers giving them control over energy cost

• Utilities have started to recognise the value of such proposition. Let’s hope that policy makers will not wait too long for recognising it as well.
Krystyna Dawson
Business Manager – BSRIA WMI
Worldwide Market Intelligence

Old Bracknell Lane West, Bracknell, Berkshire RG12 7AH
D: +44 (0)1344 465638  F: +44 (0)1344 465626
M: +44 (0)7990 595836  E: krystyna.dawson@bsria.co.uk
W: www.bsria.co.uk

More information at
www.bsria.co.uk/market-intelligence