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# The future role of heat pumps in the domestic sector

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# Outline

1. Overview
2. Characteristics of heat pumps
3. UK case study
4. Policy promoting heat pumps
5. Summary and final thoughts

# A technology with a big future?

**Current situation**

Heat pumps currently occupy a small niche in the European residential heating market.

Significant market for residential heat pumps only in Sweden, Switzerland and part of Austria, mostly in new housing.

**Future prospects**

European policy is poised to encourage the wider uptake of heat pumps.

Heat pumps widely thought to be a key technology for delivering low-carbon heating.

Many UK scenarios show heat pumps to be dominant heating technology by 2030-35.

# Heat pumps as a low carbon option

For heat pumps to deliver significant, national carbon savings*, the following factors are important:

1. Low carbon electricity available in sufficient quantity.

2. Well-performing heat pumps: need good seasonal performance factors, **well-insulated homes**, lower temperature heat distribution systems.

3. Householders adopt the technology (and are able to use it effectively).

Most of these factors are external to the technology itself.

Also need to consider possibilities of heat pumps increasing energy use / carbon emissions for cooling.

*Save carbon compared with what? Current heating systems? Expected future heating systems?

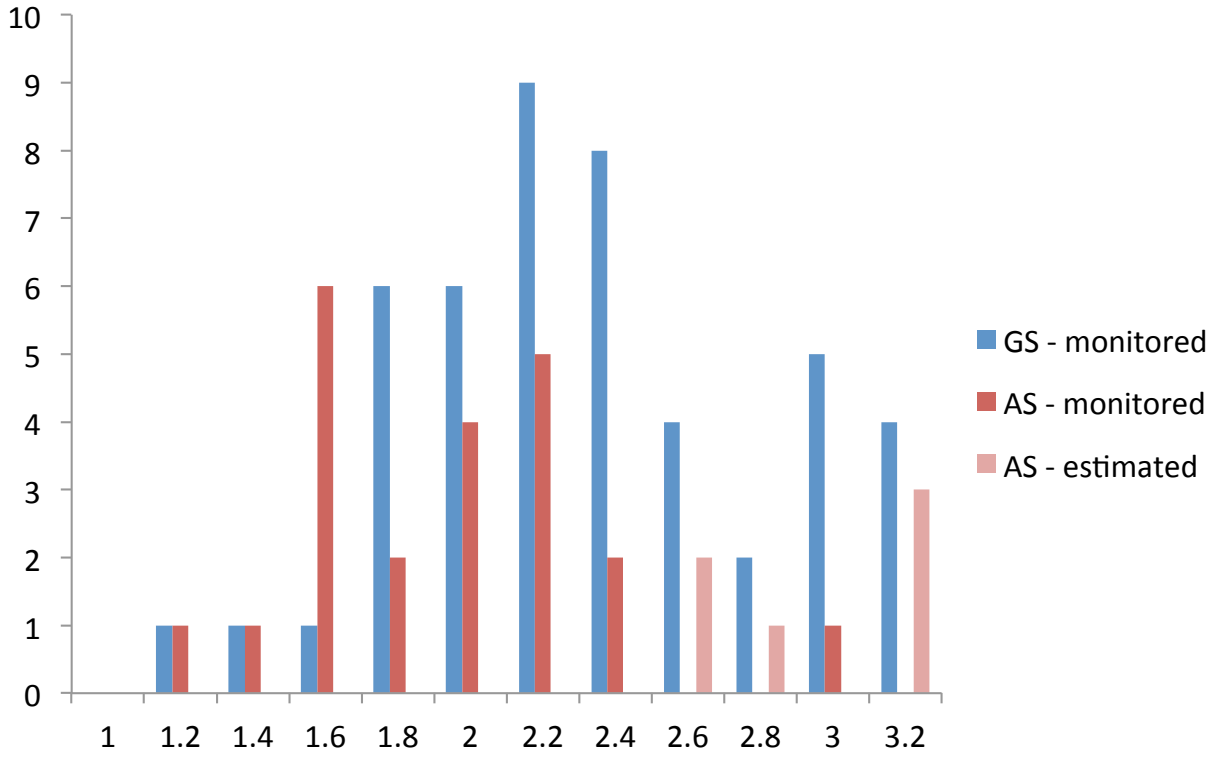
# UK facts and figures

**Current market**
Market very small – sales estimated as between 10-15,000 per year, the majority of which are ground source (GS). (Annual gas boiler sales = 1.7m)

**Costs of heat pumps**
Capital costs higher than gas or oil boilers, by a factor of 2 – 5+
HP running costs higher than gas, cheaper than oil for GSHP, cheaper than direct electricity.
Future electricity prices are expected to rise faster than gas prices (41% price rise 2010-2020, compared with 26% for gas)

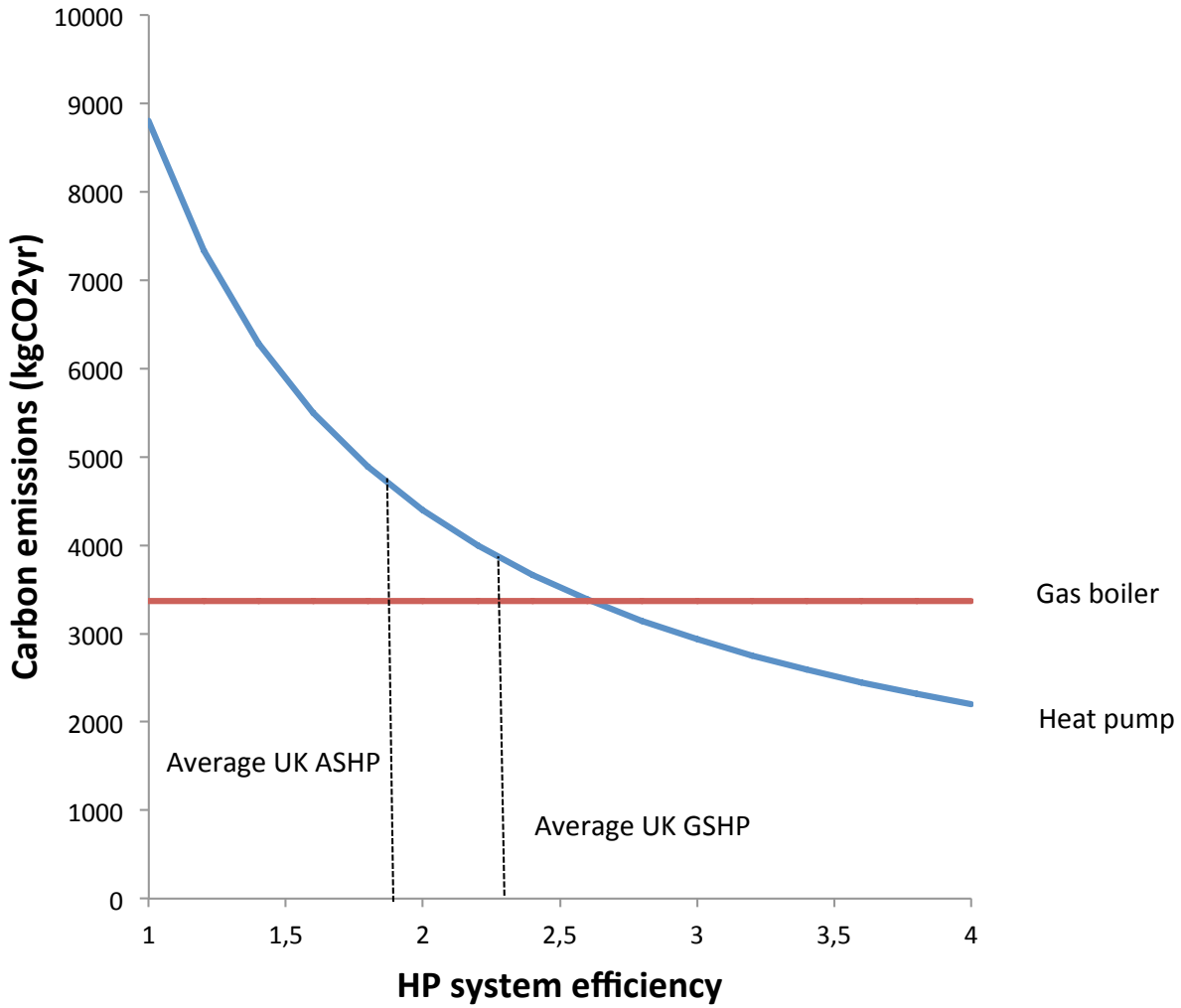
**Carbon comparisons**
NOW: UK electricity more carbon intensive than EU average. Majority of population use natural gas as a heating fuel.
FUTURE: Carbon intensity of electricity 'expected' to almost halve by 2020 and be one tenth of current figure by 2030.

# UK: EST field trials




Average seasonal COP: Ground source = 2.3, Air source = 1.9 (excluding estimated values), = 2.15 (including estimated values)

# UK: Annual carbon emissions



# UK perspectives on heat pumps

| Positive | Negative |
|---|---|
| Proven technology which can already save carbon compared with oil or electricity-based heating systems | Expensive and high carbon emissions. Only relevant to UK householders with new homes, off-gas on cost & carbon criteria |
| Suitable for mass market | In old homes upgrading insulation and changes to heat distribution system also required for HP to work well. |
| In combination with low carbon electricity, can deliver very low carbon heating system | Can lead to increased use of energy for summer cooling |
| | Require high level of skill to install and design effective systems |
| | Electricity supply side issues |

# Policy

**EU**

EU directive on renewable energy – 20% share of energy should be renewable by 2020.

ASHP and GSHP are defined as renewable as long as they reach minimum performance standards. Energy gain must be at least 15% over the input energy. Measurement standards yet to be defined, will probably equate to COP of around 2.8.

**UK**

Low carbon buildings programme gave grants for GSHP and later on ASHP. Installations in the first two years of the LCBP (2006-08) were 213 and 231 GSHP.

Renewable Heat Initiative: interim grant and feedback scheme for households begins mid 2011, to be introduced fully 2012. GSHP with COP above 2.9 will be included. ASHP not included initially.

Aim: to raise renewable heat from 1% to 12% by 2020.

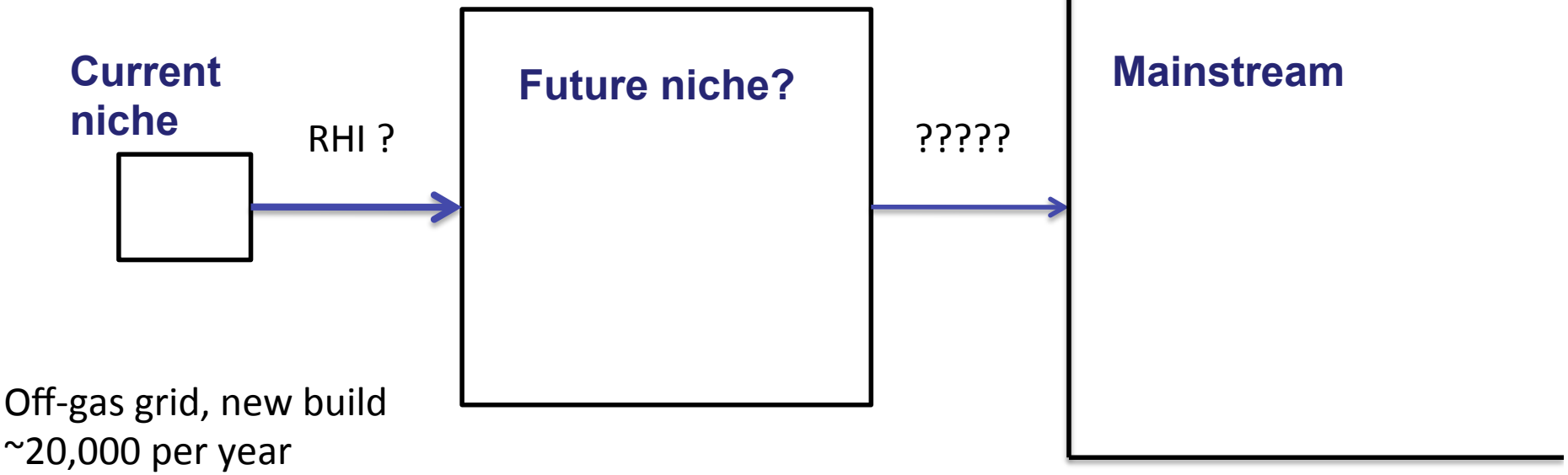
# Difficult to promote EU-wide

Factors influencing heat pump uptake include:

Housing issues
Domestic fossil fuel production
Utilisation of renewables
Climate
Utility involvement
Government support
Market networks
Geology
History of market growth
Gas and electricity prices
Extent of the gas supply network
... Amongst others...

The fact that 80% of Swedish new build homes have heat pumps, tells us little about what may happen elsewhere in Europe.

# UK: From niche to mainstream




Off-gas grid, new build
~20,000 per year

On-gas grid, new build
~ 180,000 per year

Current housing stock
~ 25 million

# Summary

- No universally true statement about the environmental benefits of heat pumps at household or national level.
- Heat pumps are not a stand-alone technology – much more complex substitution than when condensing gas boilers replaced non-condensing.
- UK market for HP very undeveloped, many poor quality installations
- New incentives coming in with Renewable Heat Initiative - may develop market (in new homes only?).
- Heat pumps highlight the challenges inherent in upgrading the housing stock. It is not a technology which makes transition to a lower carbon future easier – if anything it makes it more difficult.
- Heat pumps cannot lead us to a lower carbon future, they can only be a following technology once considerable supplies of low C electricity are available and housing stock has been refurbished.

# Final thoughts

- Can the reliance of heat pumps on improved insulation and heat distribution systems in existing homes, be turned into an advantage? An integral part of a low carbon housing system?

- Over what time scale can or should national markets for heat pumps be expanded? In advance of low carbon electricity supplies? To meet the EU 2020 deadline?

- If heat pumps are not likely to become the dominant low-carbon heating system in European homes by 2030 - 2050, what is?