Innovation in Low Carbon Home Heat and Power at Centrica

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Outline

- Strategic Context and Objectives for new technology
- Technologies in focus:
    - MicroCHP (Stirling engine solution)
    - MicroCHP (Solid Oxide Fuel cell solution)
    - Solar Water Heating
    - Domestic Wind Power Generation
    - Heat Pumps and Ground source heat pumps
- Issues in Residential Low Carbon Heat and Power Innovation
- Offshore Wind

Strategic context for new technology -

New technology <u>can</u> fulfil part of our commitment to deliver renewable energy <u>and</u> provide superior service improving customer relationships

British Gas is pursuing a number of opportunities across a range of technologies, to:

(1) Improve and deepen our **proposition /service** relationship with customers

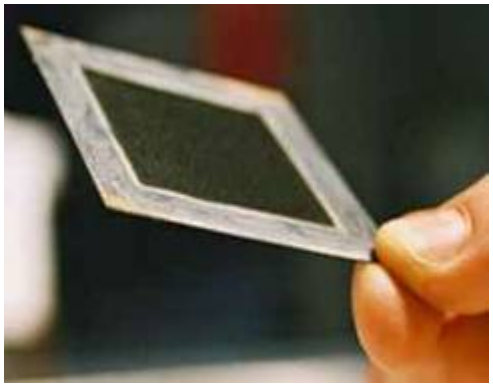
(2) Provide new **growth** opportunities – new technologies have potential to disrupt existing markets

(3) **Brand** benefits

Focus on MicroCHP - Microgen

- World first Wall mounted home energy system, distributed by British Gas
- Open Vent, System and Combi microCHP versions
- Could save over £200 per yr off fuel bills
- Electrical output > 1 kW
- Heat Output 15, 24 and 36kW
- Can work during power cut !!
- Trial over winters 2005/6 and 2006/7
- Scheduled for Launch in **2007**

Boilers powered by solid oxide fuel cells, unique British Gas partnership……



Fuel cell in the heart of a Standard Gas boiler

Unique features

- Standard low cost materials, Simpler engineering
- Silent operation, Fast start-up
- Low cost mass production
- Uses Natural Gas
- High efficiency

Ceres power judged to have the UK's best:

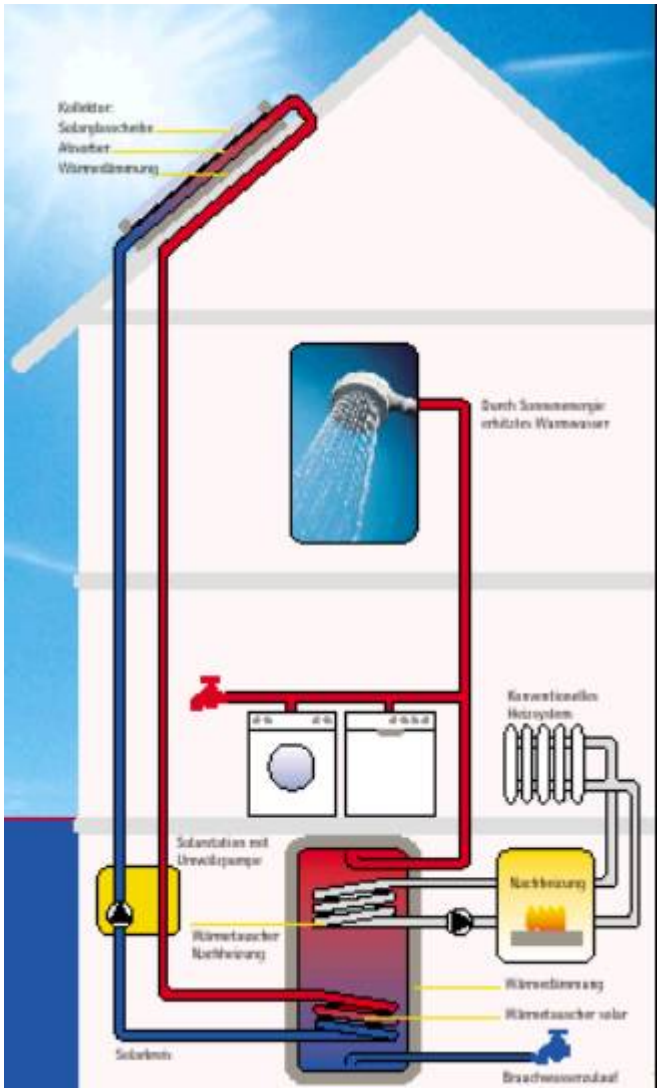
- Breakthrough innovation
- Commercial potential
- CO_2 savings / greenness

Fuel cell - the heart of a domestic boiler

- British Gas team working to jointly develop wall mounted unit

Solar Water Heating – Bosch technical solution

Flat Collector

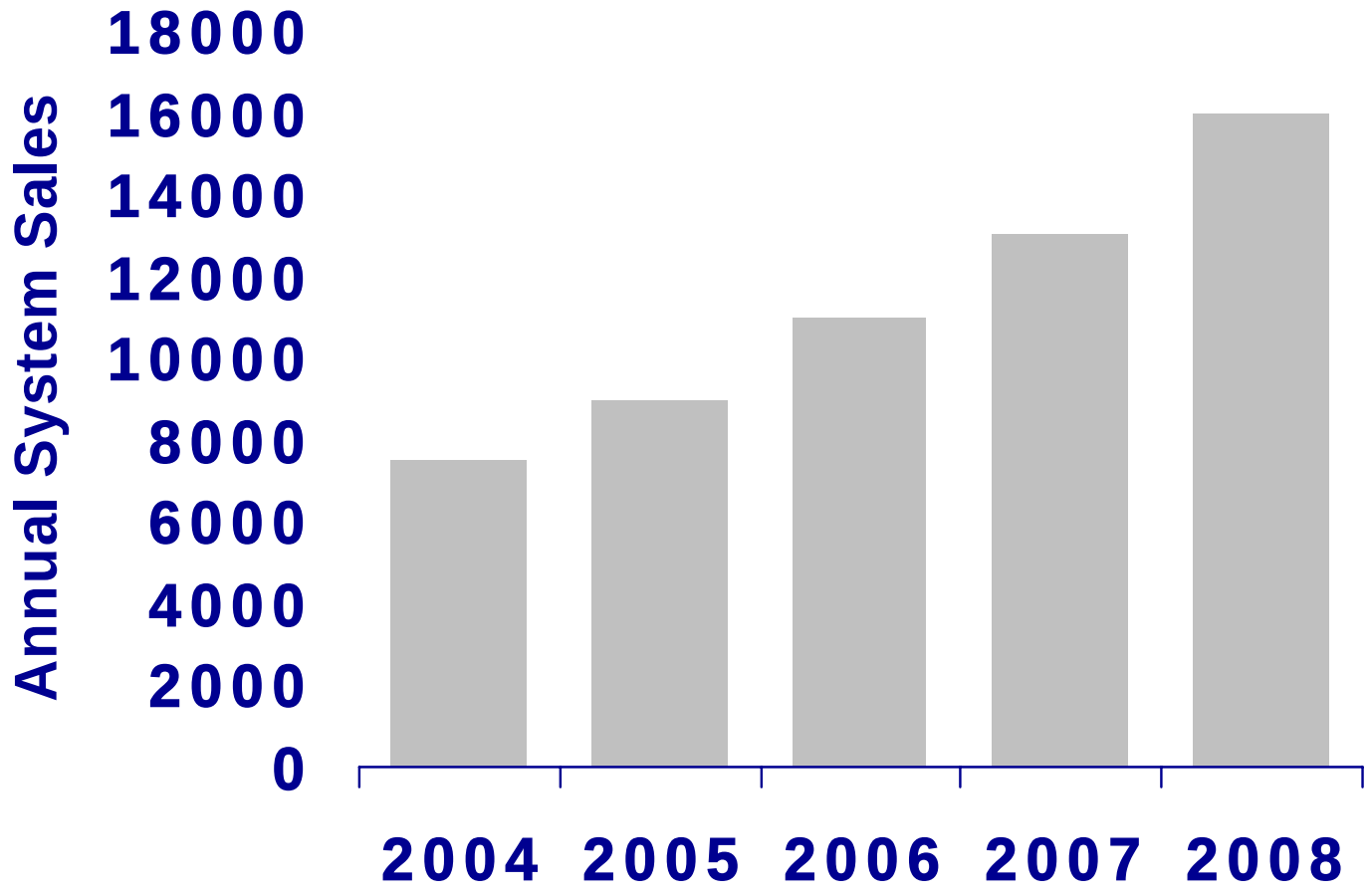


- Very good performance ratio (Efficient)
- Robust
- Environmentally Friendly
- Retail price estimate £3,500 (good payback)
- Solar will be included in LCBP funding
- Trials underway in 6 homes
- British Gas promoting via Worcester Bosch

Solar Water Heating in Domestic Homes

Three domestic solar sites in Worcester

Solar Water Heating Market Forecast



...this demonstrates that, even for a commercially viable technology, if payback period is long, market penetration will be very difficult without other stimulus

Source: BSRIA:
Building Services Research and Information Association

Ground source heat pumps

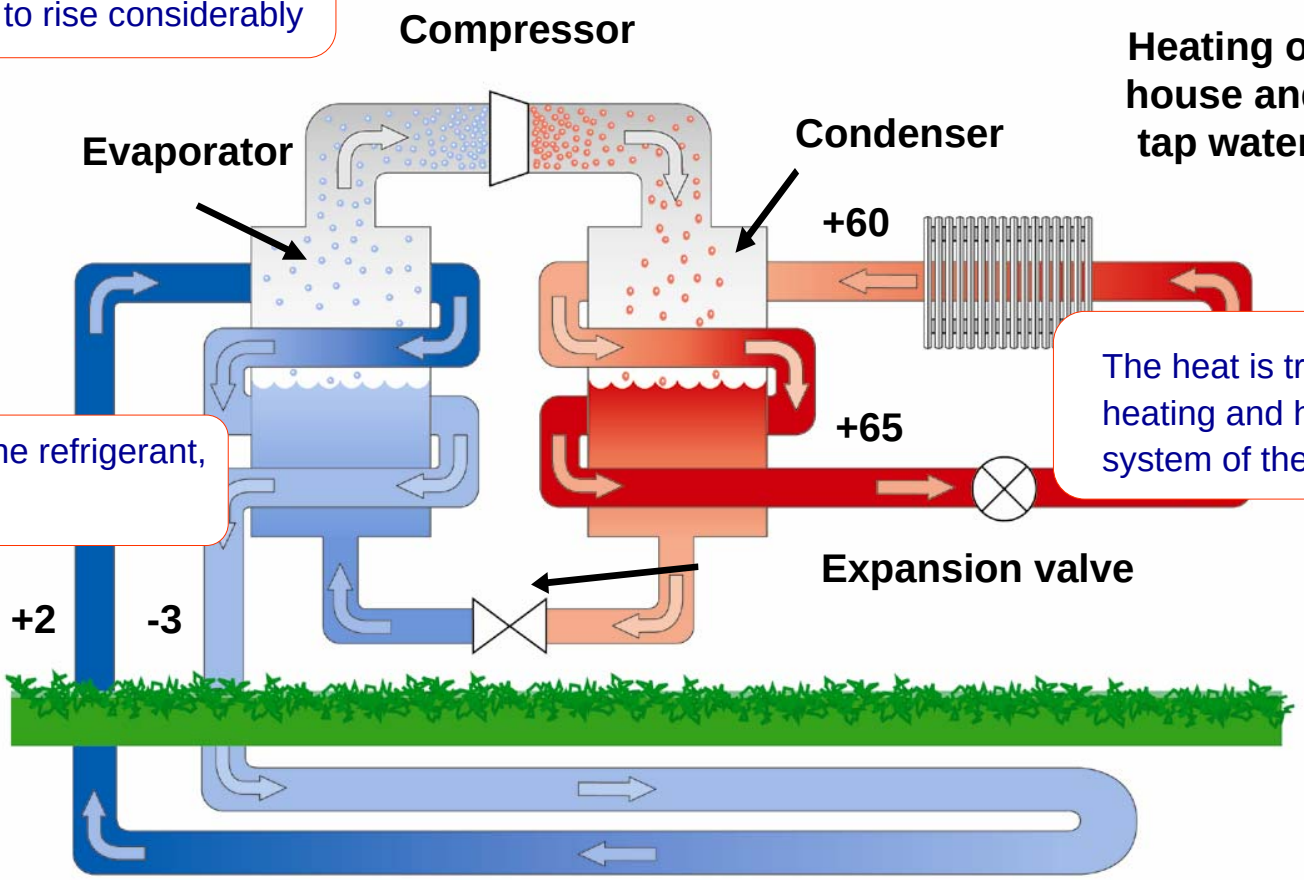
- **Currently available in EU but installed cost is an issue (£15 to £20K and site / job complexity)**
- **Payback can be elongated due to cost of installation**
- **British Gas conducting desktop research**

Tube Collector

Ground tube

How a Liquid/water Heat Pump Works

The refrigerant is then compressed causing the temperature to rise considerably



The liquid heats the refrigerant, which evaporates

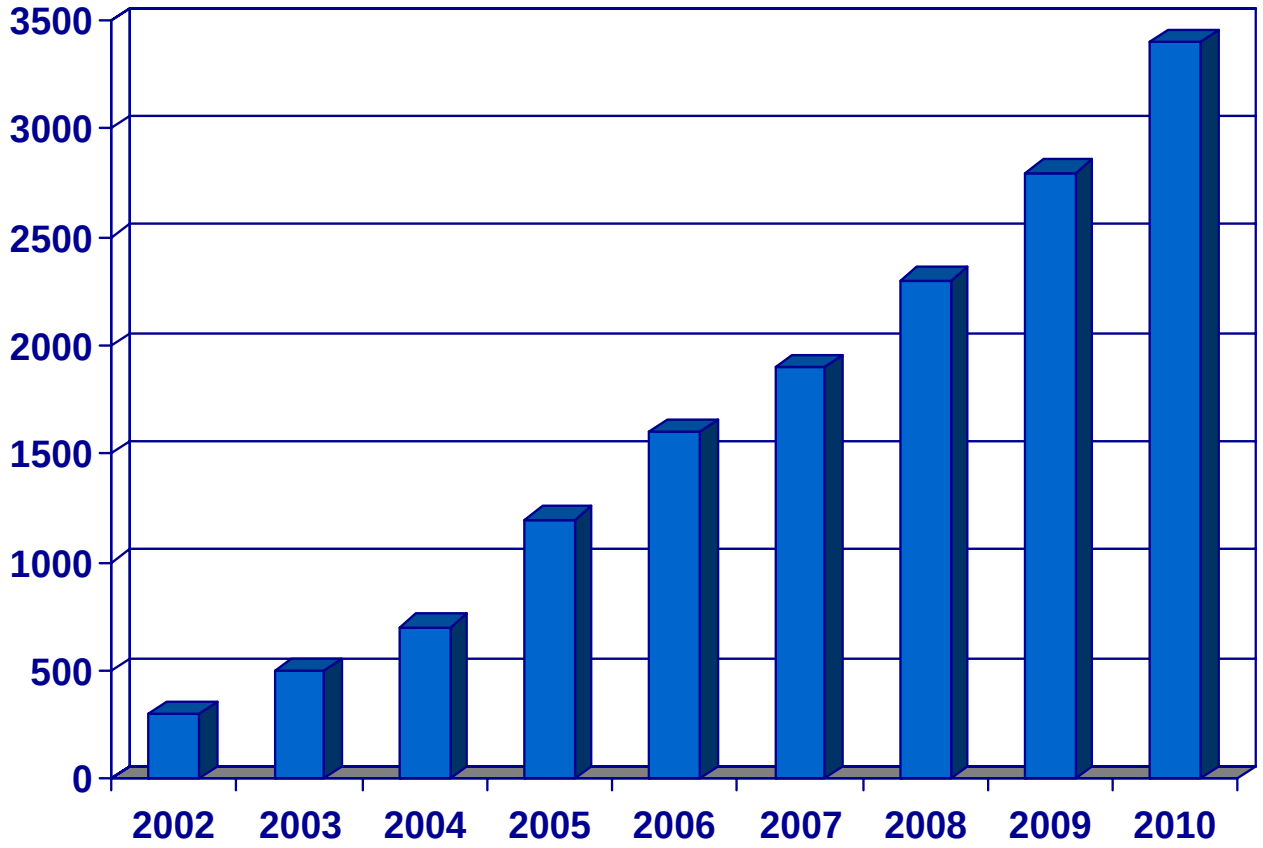
The heat is transferred to the heating and hot water system of the house

Heat transfer medium (glycol/water) circulates in a plastic hose, it is heated by the soil

Heat Pumps in the UK –typical current application

Heat Pump Market forecast 2002 - 2010

- UK is generally seen as one of the highest potential markets in Europe

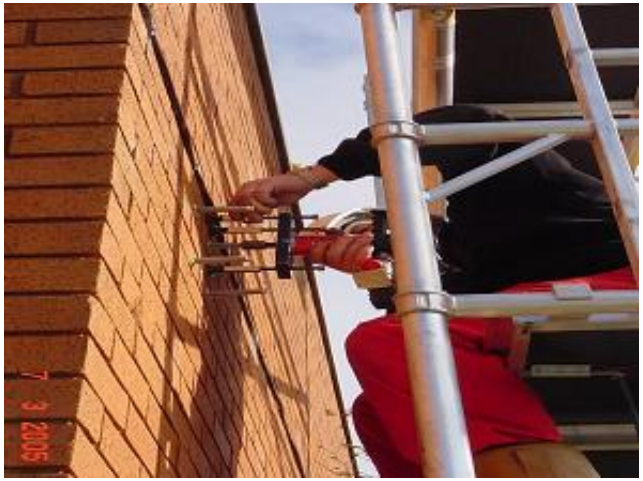


Windsave – domestic power generation

- BRITISH GAS EXCLUSIVE
- OUTPUT OF 1KW
- ELECTRICITY FED DIRECTLY INTO THE RING MAIN
- YEARLY SAVING (EST) £166
- VIRTUALLY NO VIBRATION OR NOISE
- PROVIDES ADDITIONAL INCOME THROUGH **"GREEN DIVIDENDS"**
- GRANTS AVAILABLE TO SUBSIDISE PRICE OF £1500
- IF TRIALS SUCCESSFUL SALES STARTING 2007

Installation……..

- USUALLY INSTALLED WITHIN 2 HOURS
- NO INTERNAL ADDITIONAL WIRING REQUIRED
- PLUG IN AND START TO SAVE



Offshore Wind

- Barrow offshore wind now generating
- As in other round 1 projects, construction was far from problem-free
- Combined with high steel prices, creating “funding gap” on offshore
- Further transitional support for this vital technology is required

Issues in Developing / Deploying Low Carbon Residential Heat and Power

- Early stage technology development ("bleeding edge") not well suited to utilities
- Existing frameworks (including EEC) can stimulate "near market" technologies – but EEC needs overhaul
  - "input" vs. "output" based
  - Inflexible (focused around one core product, doesn't encourage innovation)
  - Mixed objectives (energy efficiency vs. social)
- For systems with power export potential, regulatory difficulties:
  - Metering and export rewards important
  - Multiplicity of players (DNO, meter owner, supplier)
- Customer pull very difficult unless payback period very short – discretionary spending
- Uncertainty of returns - "lumpy" and politically susceptible mechanisms
- Joint venturing working well and seen by Centrica as way forward
  - Inevitable technical "gremlins" in transition to scale manufacturing – sometimes may need transitional support