

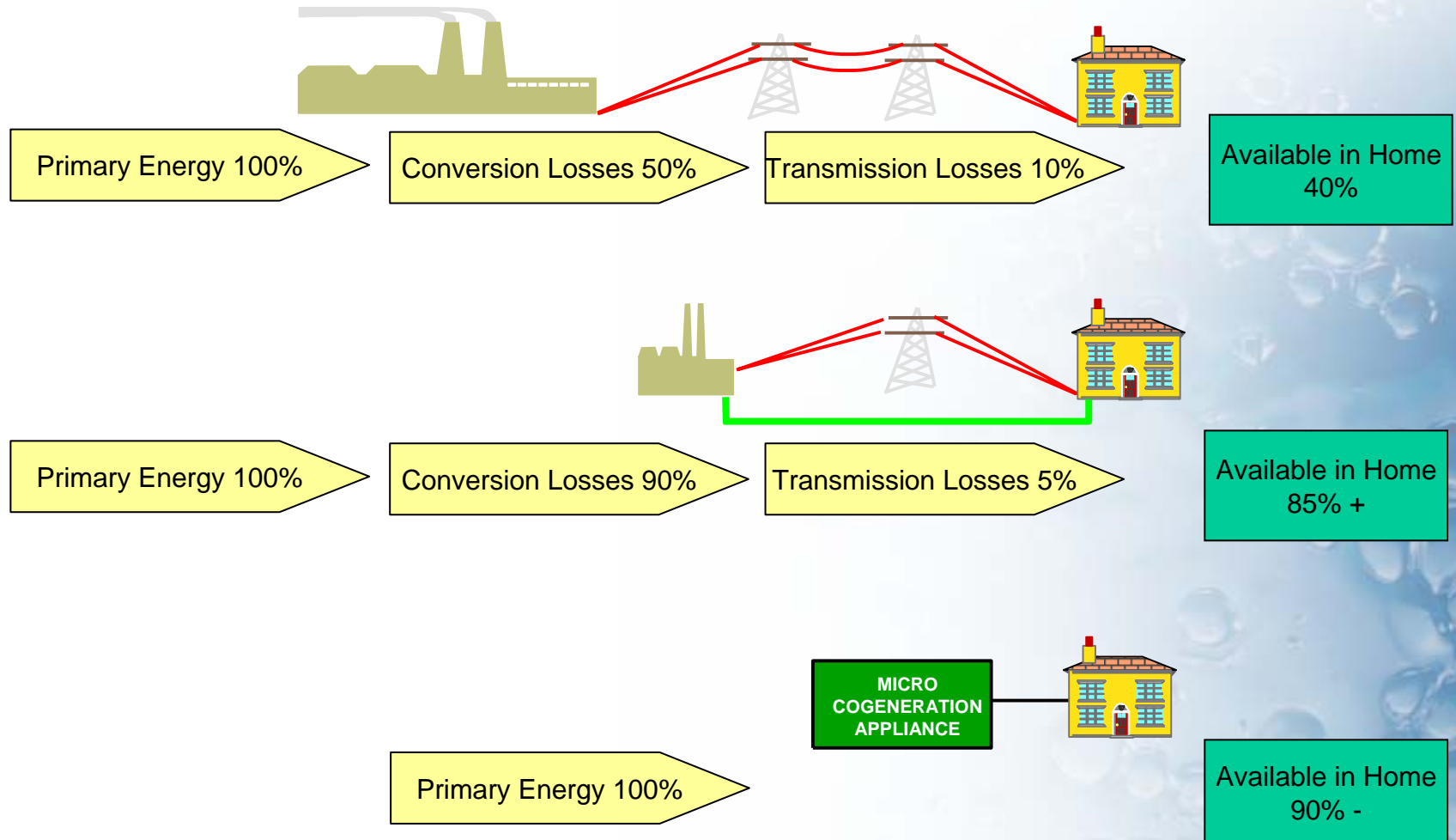
# 'Home on the Range'

Combined Heat and Power

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# Primary Energy Conversion



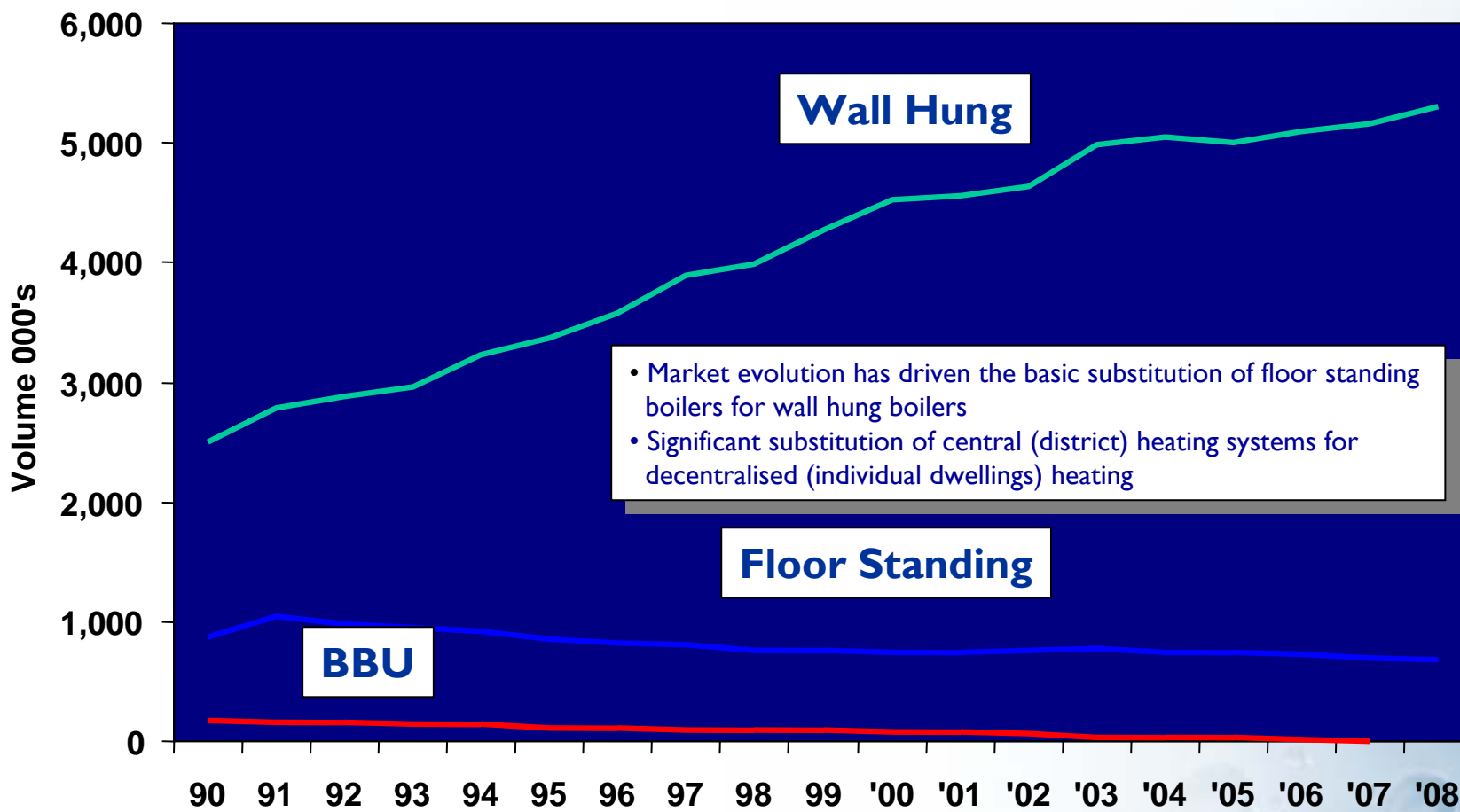
# District, mini or micro

- Little to choose in terms of overall efficiency
- All three have a role
- Distributed generation
- ‘Horses for courses’
- Local considerations
- Type of ownership
  - Landlord obligations & preferences
  - End user preferences

# Needs and Wants

- The environment needs the best sustainable solution
- The end user wants
  - a cheap to run system
  - Their 'own' boiler
- The boiler market a relatively soft target in order to achieve high levels of penetration

# European Gas Boiler Market



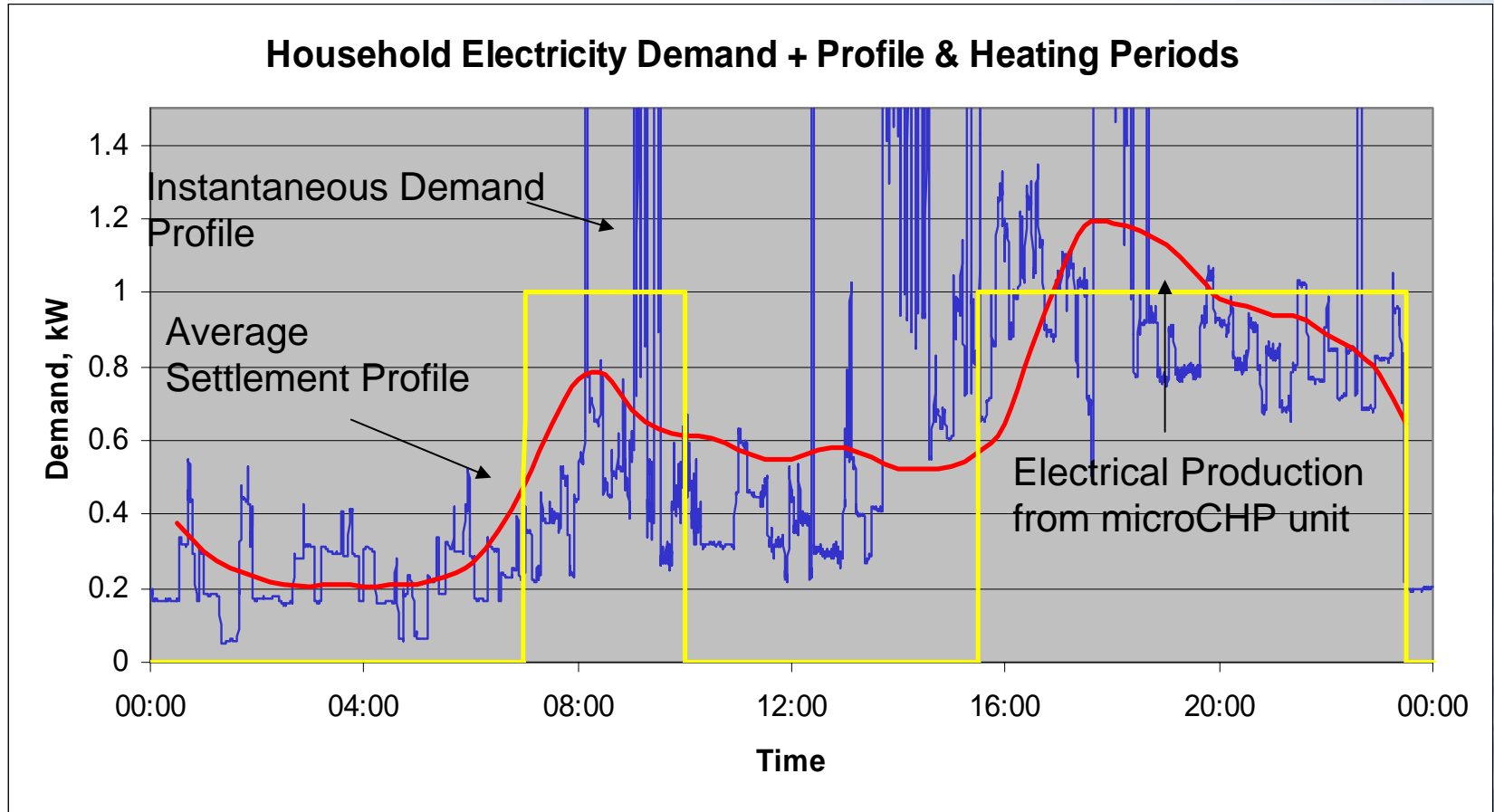
# UK Gas Boiler Market

- 1.5 million gas boilers a year
- 21 million households with gas boiler
- 15 million households suitable for  $\mu$ chp

Year	2006	2007	2008	2009	2010	2015
Sales	5,000	16,000	46,000	90,000	160,000	300,000

Clearly a large gap exists between the above and some predictions of the number of UK households which might have micro chp by 2050. One big unknown is the timing and impact of a cost effective fuel cell. These are unlikely to appear by 2015.

# So – What do we need ?



# Effect on Grid

- Electricity suppliers are in many ways master of their own destiny
- Zero or low export value
  - very little impact
- Higher export value
  - more impact
- Incentives
  - significant impact

# Is the Region Different

- From a micro chp viewpoint probably not
- Wide diversity of communities
- Greater than average opportunities for renewables
  - Wind Farms
  - Tidal power
  - Solar, even the NW has access to the sun!
- Nuclear Industry is substantially NW based

# Evolution of mini/micro CHP Technologies



- Internal Combustion (IC)
  - ‘Here and Now’ technology
  - Mini-CHP
  - Products on the market
    - DACHS, Honda, ecopower, etc
- External Combustion (EC)
  - Commercially available in the next few years
  - Stirling engines, Rankine Cycle engines
    - i.e. Baxi, Microgen, Whispergen, ENATEC
- Fuel Cell (FC)
  - Commercially available 2012 – 2015
  - PEM, SOFC
    - Prototypes on the market now



# Baxi - Internal Combustion

- Acquisition of Senertec GmbH in March 2002
  - Leading mini-CHP player in Europe.
    - 5.5kWe gross electrical output, 12.5kW heat output
    - CO<sub>2</sub> emissions savings of 5 tonnes per unit/Annum (17 hours a day operation)
    - 3,500 run hour maintenance intervals
- Approx. 10,000 units in Germany by the end of 2004.
- Baxi Technologies (UK) launched the DACHs 5.5KWe unit to the residential/ light commercial market in Sept 2002.
- End of 2004; 45 units installed in multi occupancy sheltered accommodation



# Baxi - Fuel Cells

- Acquisition of european fuel cell (efc) gmbh in October 2002
  - Europe's leading PEM fuel cell system integrator with ISO 9001 accreditation
  - Over 10 years experience in the installation and maintenance of 'Alpha' fuel cell CHP systems.
  - Development of the 'Beta Prototype' "Home Energy Center" for domestic applications providing heat and power.
  - Unlikely as a domestic wall hung product



european fuel cell gmbh



# Baxi - External Combustion

- Baxi Micropower formed in April 2004.
- Acquired the IP and Development rights of the Organic Rankine Cycle (ORC) Engine/Scroll Expander based micro CHP appliance
- Working Prototype developed to demonstrate feasibility of the approach with key components:
  - Working fluid
  - Scroll Expander
  - Generator

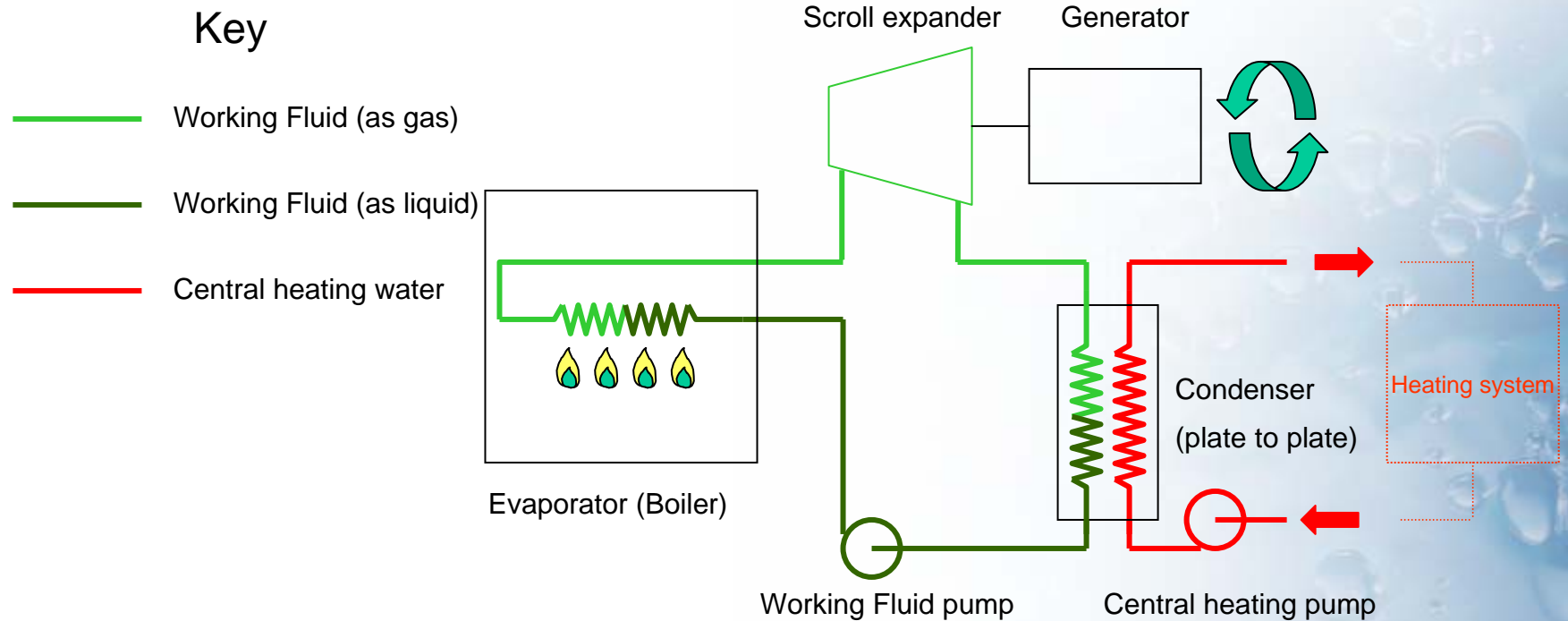


# Baxi Micropower



- Wall hung
- 1000X550X350
- < 70Kg
- 1kW Electrical
- 10 to 30 kW heat
- Single Phase Connection
- Self diagnostics
- Installer friendly
- Consumer friendly

# ORC Schematic



# Home on the Range



Thanks for listening

