

Living with domestic CHP

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EA Technology field trials

- 1990 feasibility study
- 1999 laboratory trials & evaluation
- 2000 sheltered trials (5 units)
- 2001 alpha trials (20 units)
- 2002 beta trials (30 units)
- 2003 “commercial” trials?

2002-2003 TRIALS

- 30 installations
- 15 Ipswich area
- 15 Chester area
 - 10 existing
 - 5 new
- Mix of sizes, ages, constructions and occupancy





Example trial house

- 138m² total floor area
- three storey - living on mid floor
- built 1998
- insulation to Building Regulations
- usage pattern
 - continuous occupancy
 - copious showers



Original heating system (1)

- Wall-hung, non-condensing boiler in kitchen (mid-floor)
- Y-plan (3-port valve)
- fully pumped system
- 7-day programmer
- strap-on cylinder thermostat



Original heating system (2)

- Single zone micro-bore
- TRV to all except mid-landing dump radiator
- thermostat on mid-landing
- separate DHW and space heating programmes
- questionable radiator sizing/commissioning



Changes since last year

2002

- Technical specification
 - 800We/7kWt
- Configuration
 - boiler in series
- Monitoring
 - integrated into controller
- Characteristics
 - noise/appearance
- Control (optimised)

2003

- Technical specification
 - 1.2kWe/9kWt
- Configuration
 - no supplementary
- Monitoring
 - detailed (not all homes)
- Characteristics
 - noise/appearance
- Control (conventional)

Micro CHP system (1)

- MK III WhisperGen
- Directly below boiler in kitchen
- Integral G83 LOM protection
- Controlled from existing programmer (run signal)
- Remote data logging and on-line diagnostics



Micro CHP system (2)



- Differences from boiler system
 - smaller peak thermal output
 - overrun (pump fed from engine)
- Location
 - floor mounted
- Connection
 - G83
 - normal flow temperature

How does it compare?

GAS BOILER

- thermal response
 - TRV coarse control
 - thermal inertia
- stratification
- DHW recovery time
- noise
 - annoying but accepted
- appearance
 - compact
 - location compromise

MICRO CHP

- thermal response
 - needs thermal buffer
- stratification
- DHW recovery time
 - thermal store solution
- noise
 - OK for location
- appearance
 - large but acceptable

Performance

Problems I feared

- noise
 - no problem
- vibration
 - no problem
- failures
 - on-line diagnostics
- inadequate heating
 - no problem

Benefits I hoped for

- savings
 - gas
 - electric
- comfort
 - MIT
 - Hot water
- green credentials



The ideal customer?

- High demands for comfort
- High demands for hot water
- Consequently high energy use offers potential for big savings
- Prefer to pay for energy service rather than product
- Micro CHP offers improved energy efficiency without compromising comfort

Environmental comments

- will target CO₂ savings be achieved?
 - higher mean internal temperature (MIT)
 - more likely to mitigate increase in energy demand than actually reduce it?
- target market (not fuel poor)
 - % savings
 - comfort factor



Subjective reactions







Consumer panel

- Adult male
- Adult female
- Teenage female
- Teenage males (2)

Consumer experience (1)










ADULT 1

- hot water 
- heat (24°C) 
- control 
- pipes 

Consumer experience (2)



ADULT 2

- hot water 
- heat (24°C) 
- control 
- pipes 
- garage 
- gas bill 
- electricity bill 

Consumer experience (3)



TEENAGER 1

hot water



TEENAGER 2

“when are we getting one?”

TEENAGER 3

“I’m on level 4”

The other experiences

- 80% of respondents want to keep the system
 - impossible for some
- All have demonstrated significant energy savings
- Systems have performed well
 - excellent service support
- Some supplementary heat requirement for larger houses

Conclusions

- Raises awareness of pre-existing shortcomings
- Anticipated energy savings may lead to higher comfort demands and consequently lower savings
- Need to target customers carefully and give clear message about what micro CHP will or will not do for them
- Excellent service support essential

What happens next?

- Live market test
 - partnership with housebuilder
- 400 systems to be sold - winter 2003/04
- Majority will be new-build with thermal store
 - improves performance
 - simplifies installation
- Need for ongoing monitoring
 - profile settlement (economic)
 - SEDBUK, EEC etc (environmental)