

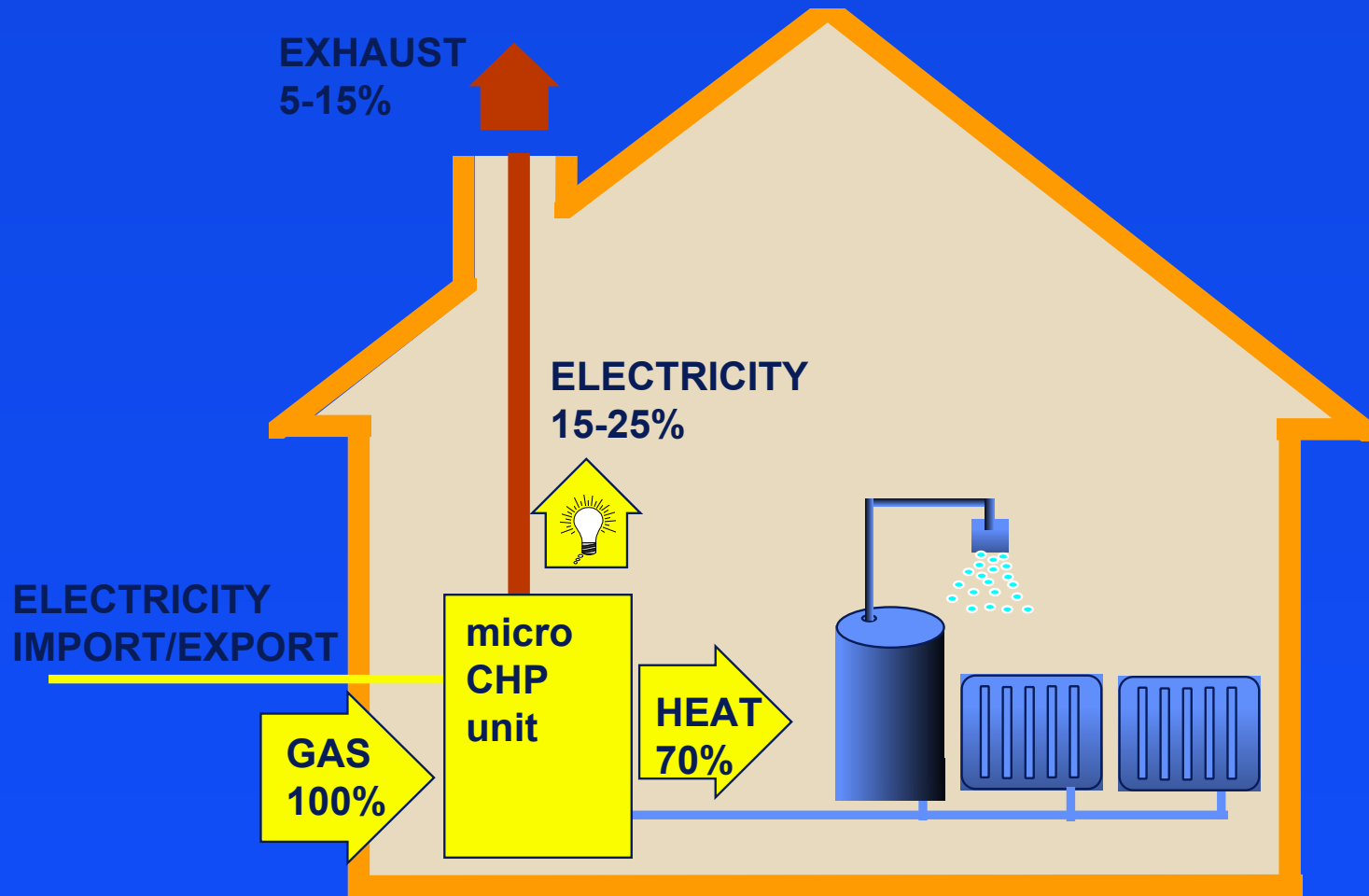
MICRO CHP (COMBINED HEAT & POWER)

Jeremy Harrison
EA Technology

WHAT IS *micro* CHP ?

- An individual CHP unit in each home
- Thermally led operation-replaces gas boiler
- 3500 hours maintenance-free operation
- Volatile electrical loads
 - 150W baseload
 - 400-600W average
 - >20kWe peak
- Implicit import/export & energy trading

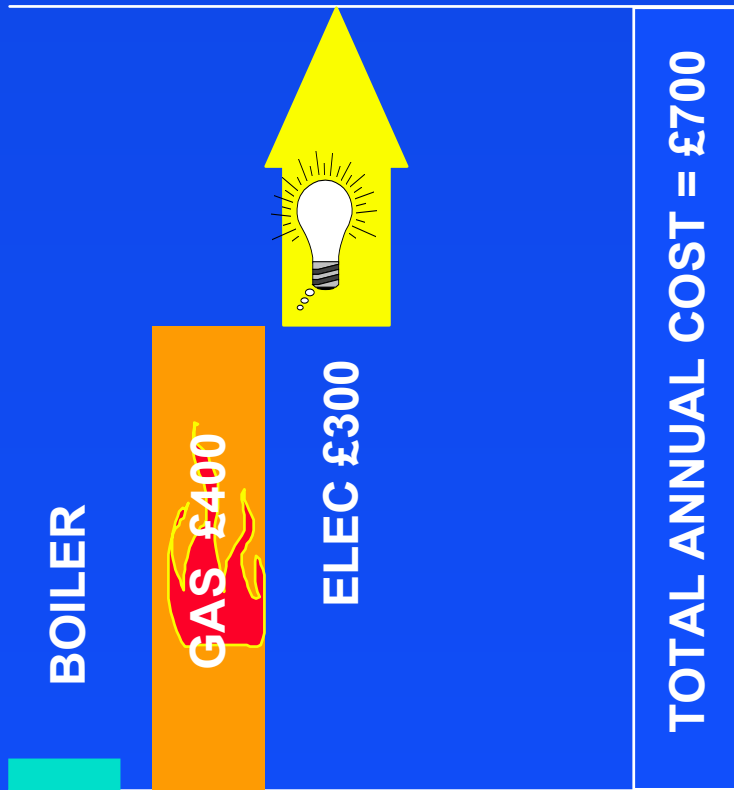
MICRO CHP SYSTEM CONCEPT



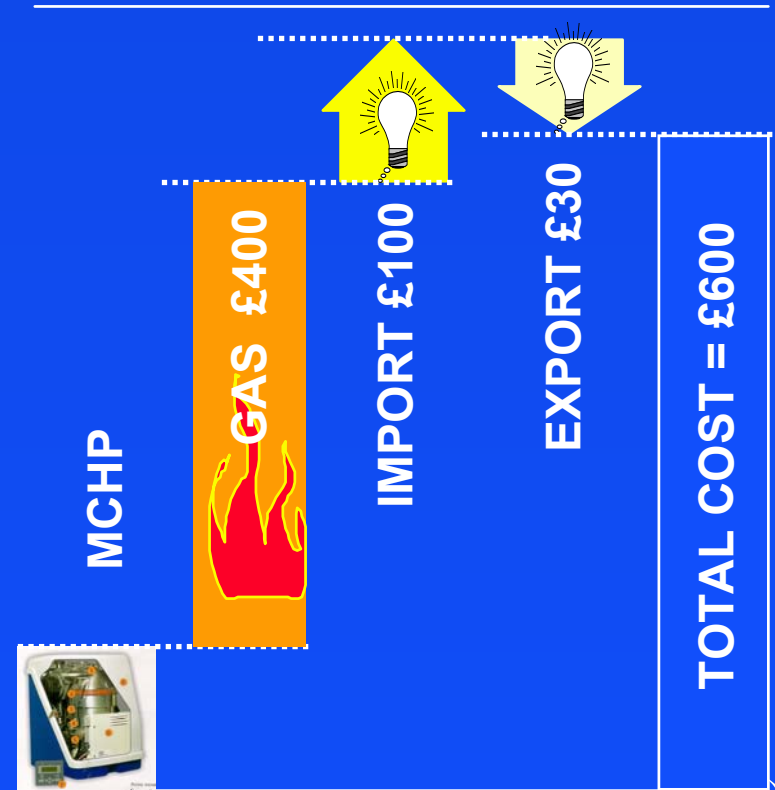
END-USER ECONOMICS

(MARGINAL ANNUAL COSTS)

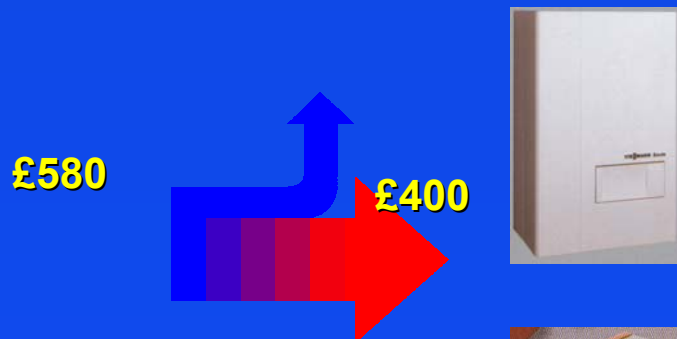
CONVENTIONAL BOILER
20 000kWh THERMAL DEMAND



1 kWe SE MICRO CHP UNIT
4 500kWh ELECTRIC DEMAND



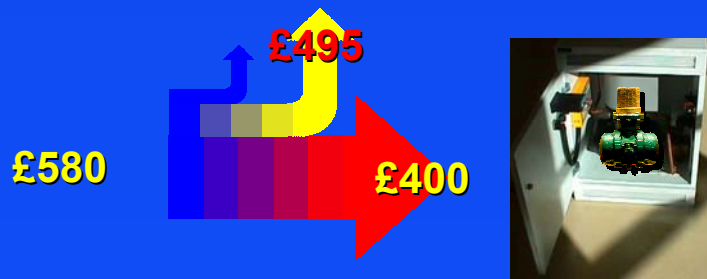
ENERGY & FUEL COST COMPARISONS



- **CONVENTIONAL BOILER**
 - 70% HEAT
 - 30% WASTE
 - £400 VALUE

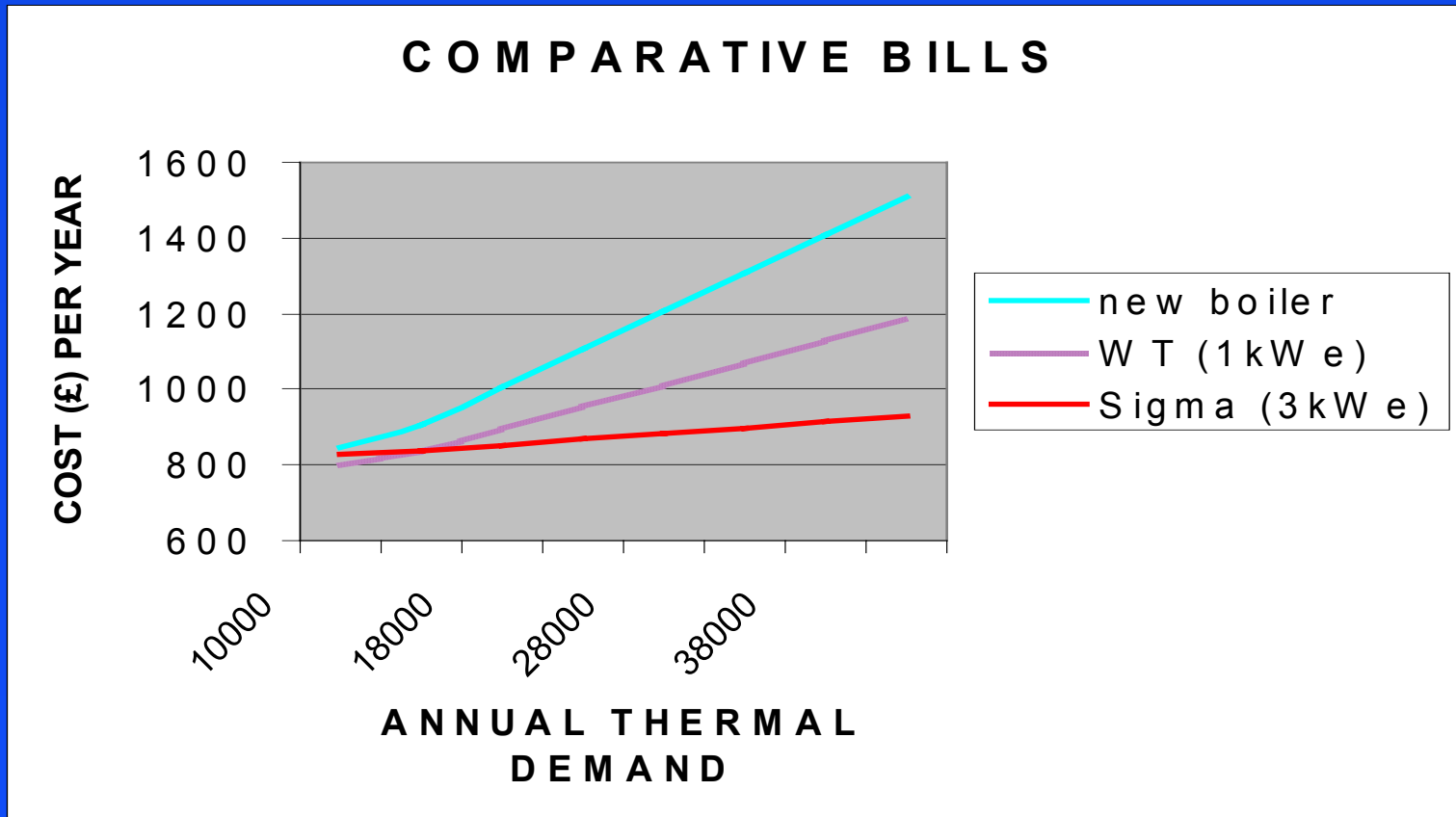


- **CONDENSING BOILER**
 - 95% HEAT
 - 5% WASTE
 - £550 VALUE

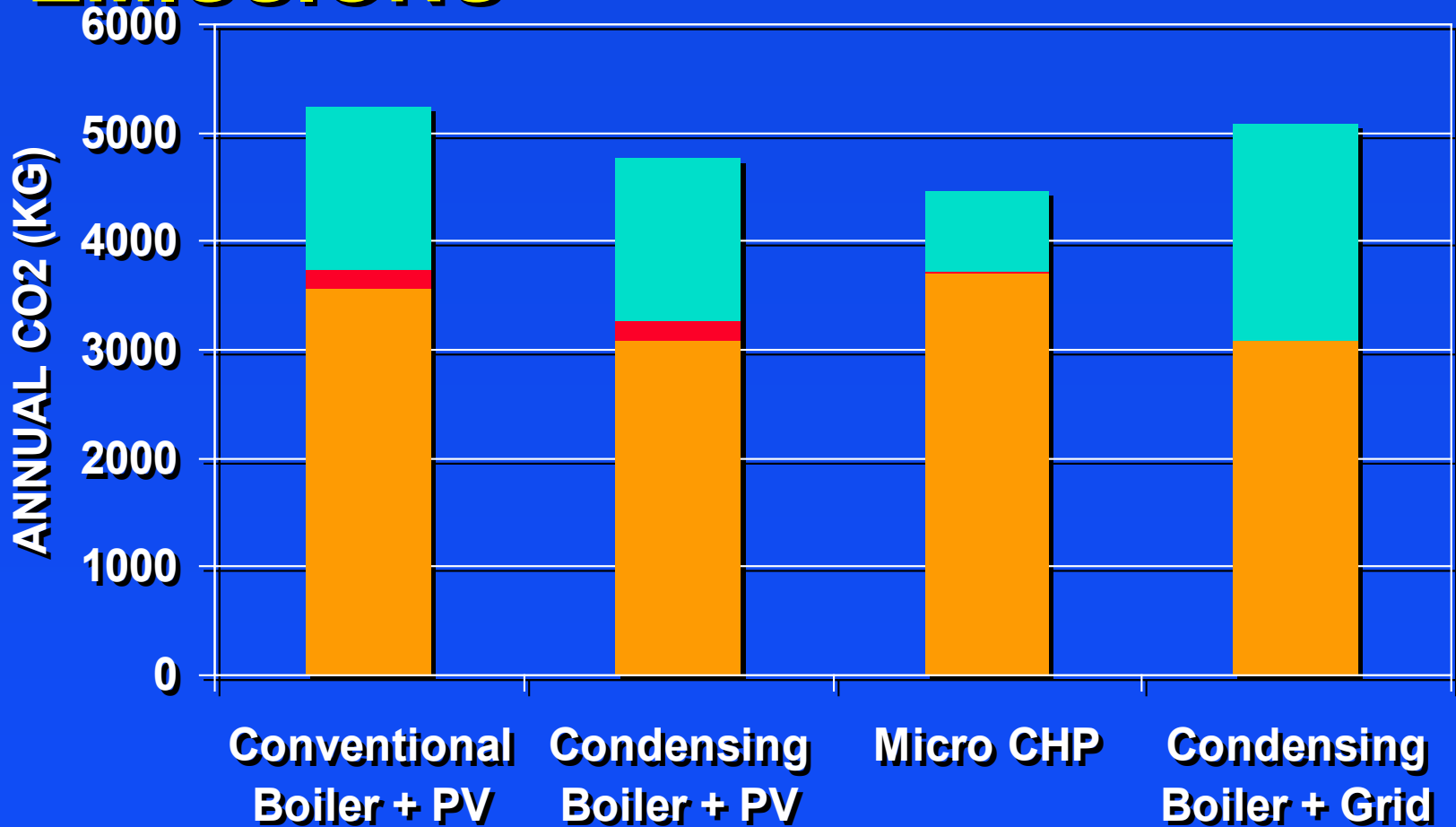


- **MICRO CHP**
 - 70% HEAT
 - 25% ELECTRIC
 - 5% WASTE
 - £895 VALUE

SIZING UNITS TO SUIT THERMAL DEMAND



LIFE CYCLE DOMESTIC CO₂ EMISSIONS



gas embodied net (grid) electricity



technology

POTENTIAL UK IMPACT

- **15-22GW installed capacity**
- **equivalent to nuclear capacity**
 - (not necessarily output)
- **12 million homes suitable for mCHP**
- **ultimate 67 million tonnes CO₂ reduction pa**

KYOTO TIMEFRAME

- **250 000 systems per year**
- **3 million tonnes CO₂ annually by 2010**

MICRO CHP DRIVERS

- **Technology**
 - **Stirling engines in appropriate application**
 - **High temperature materials/burners**
- **Environment**
 - **Political motivation**
 - **Economic value**
- **Market liberalisation**
 - **Need for differentiation**
 - **Regulatory obligations**

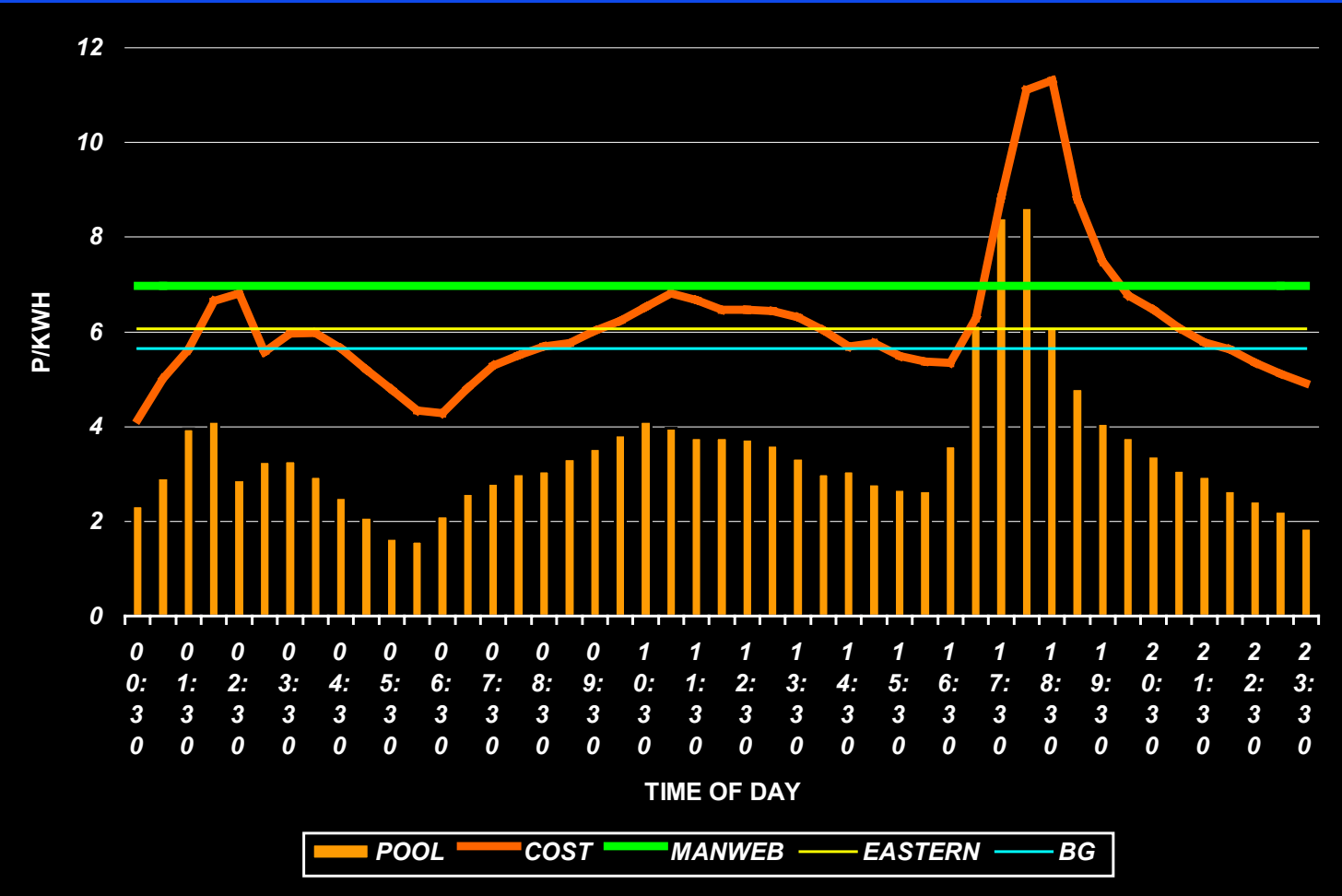
LIBERALISED POWER MARKET

- **Electricity market**
 - Wholesale market common to all
 - Common distribution charges
 - Common transmission charges
 - Resultant very small margins
- **Critical mass of customers - 5 million?**
 - Optimise customer management
 - Optimise asset utilisation
- ***Or... Differentiation***

MICRO CHP - A PARADIGM SHIFT

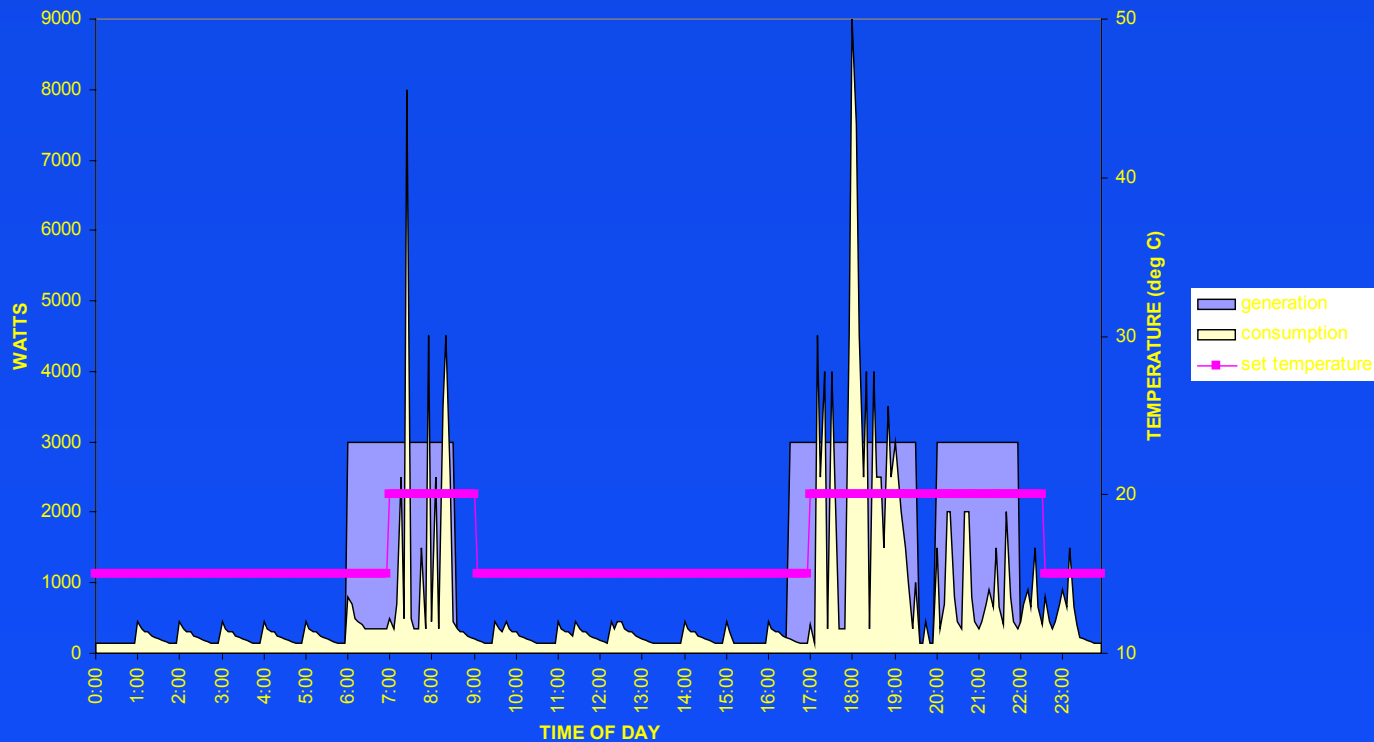
- **Micro CHP disrupts conventional economic mechanisms**
 - **Substantially greater profitability**
 - **Improved customer retention**
 - **Beneficial impact on related business**
- **Response to micro CHP**
 - » **Ignore**
 - » **Obstruct**
 - » **Embrace**

ELECTRICITY COST PROFILE

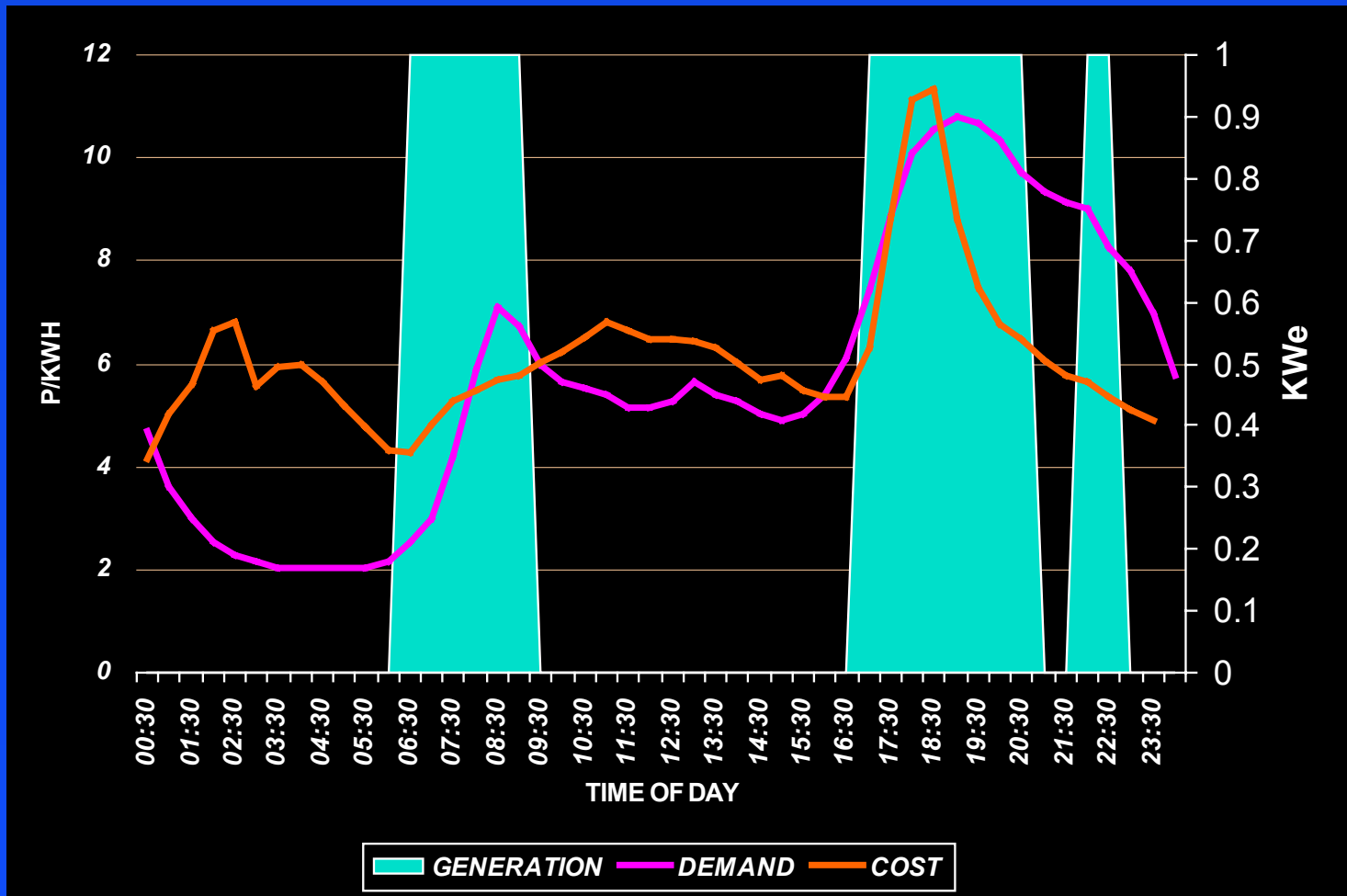


DOMESTIC PROFILE: TYPICAL INDIVIDUAL HOME

ELECTRICAL LOAD & GENERATION PROFILES



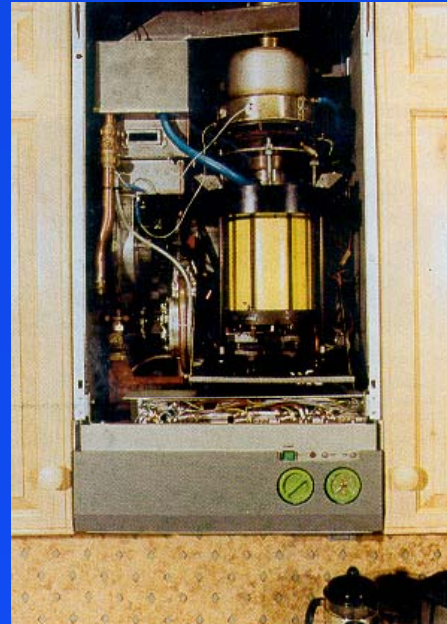
COINCIDENCE OF HIGH COST WITH MCHP GENERATION



WHO CAN DELIVER TECHNOLOGY?



Sigma
3kWe, 9kWt



Advantica
1kWe, 4kWt



WhisperTech
1kWe, 6kWt

BENEFITS FOR HOUSEHOLDERS

- **Reduces householders' fuel bills**
- **Predictable, stable costs for heat & power ("arbitrage")**
- **"Feel-good" factor for customer**
 - Environmental
 - "Revenge"
- **No maintenance hassle**
- **Option for stand-alone-no power cuts**
- **Particularly suitable for larger homes**

BENEFITS FOR HOUSEBUILDERS

- **Reduces infrastructure costs**
- **“Green” image for builder**
- **Improves SAP rating**
- **Potential build cost trade-off**
- **Capital cost transferred to ESCo**
- **Energy service including maintenance**
 - added value
 - lower cost

CONCLUSION

- **Technology issues mainly resolved**
- **Products expected to reach market in 2 years**
- **Delivery chain through ESCo**
- **Significant market penetration within 10 years**
- **Simplification of connection standards and procedures essential**
- **Equitable metering & settlement required**