Heat Pumps in the East of England

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Regional Microgen Coordinator

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Energy Saving Trust in the East

- Impartial, independent advice service
- 60M citizens to act on climate change
- Energy, Renewables, Transport, Water, Waste
- EST Advice Centre
  - Norfolk, Suffolk and Cambridgeshire
  - Hertfordshire, Bedfordshire and Essex
- Call centre – 0800 512 012
- Network of 11 regional Microgen co-ordinators

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Why heat pumps in this region?

- Off gas potential
- Oil, LPG or electric heating
- EofE average 20% off gas
  - 6% to 57%
- From 27,720 Home Energy Checks
  - 30% off gas
  - 19% to 50%
- 170,000 off gas households

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How does a Heat Pump work?

- Refrigeration system. The refrigeration cycle is an efficient provider of heat as well as cooling.
- There are two principle locations in the transfer of heat;
  - the place where heat is absorbed, (the source), and
  - where it is rejected, (the destination).
- The compressor in the refrigeration system also produces waste heat, and a significant proportion of this can be recovered.
- Hermetically sealed and pressurised, thereby reducing noise, space and heat losses.
- Absorbed heat is transported by refrigerant with low boiling point through a sealed system of pipes and circulated by a compressor.

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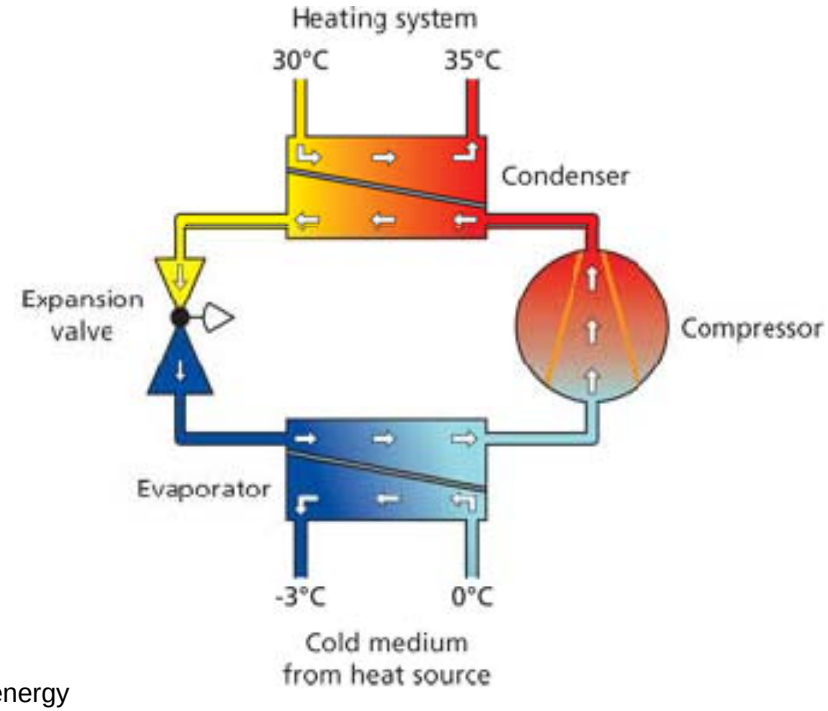
How does a Heat Pump work? 2

- A metering device controls the flow of refrigerant.
- Refrigerant boils from a liquid to a vapour then condense back to a liquid.
- Absorption and release of heat into and from the refrigerant.



Courtesy of Grenergy

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How does a Heat Pump work? 3

- Continual process while the compressor is running and circulating the refrigerant.
- High pressure liquid refrigerant is fed through the metering device into the evaporator heat exchanger
- It evaporates into a vapour by absorption of heat from the heat source (air, water or ground) passing through the heat exchanger.
- The relatively cool return vapour is drawn back to the compressor.
- The cooled return vapour from the evaporator is passed over the compressor motor windings within the heat pump, thus cooling the motor.

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How does a Heat Pump work? 4

- Much of the energy absorbed by the electric motor driving the compressor is absorbed into the refrigerant.
- The combined heat from the source, plus much of the waste energy from the electric motor is then compressed to a high temperature vapour.
- It enters the condenser heat exchanger where it is cooled and condensed into a high pressure liquid ready to begin the cycle again.
- The heat released during the process of condensing the refrigerant to a liquid is rejected via the heat exchanger directly into air or transferred to water to heat the building.
- The air or water temperature at this point could be 43ºC to 60ºC, depending on the design of the system.

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What are the benefits?

- Highly efficient use of energy input
- Lower carbon emissions
- Clean Energy Cashback (Energy Supplier)
  - Proposed Renewable Heat Incentive
  - Microgeneration Certification Scheme (MCS)

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Why MCS?

- Clean Energy Cashback
  - Feed In Tariff payments
  - Renewable Heat Incentive payments
- Promoted by DECC, Ofgem and the EST
- Product and Installation company standards
- Annual checks
- Customer care (REAL Assurance)
- Consumer and industry confidence

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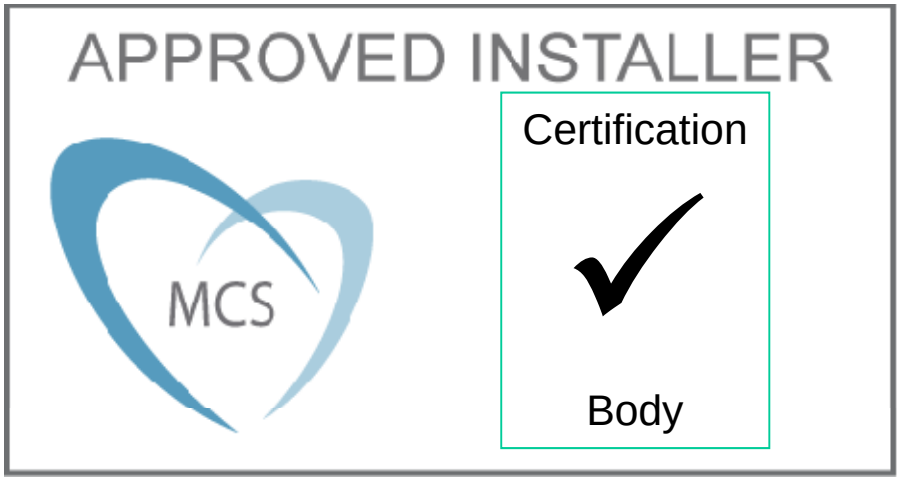
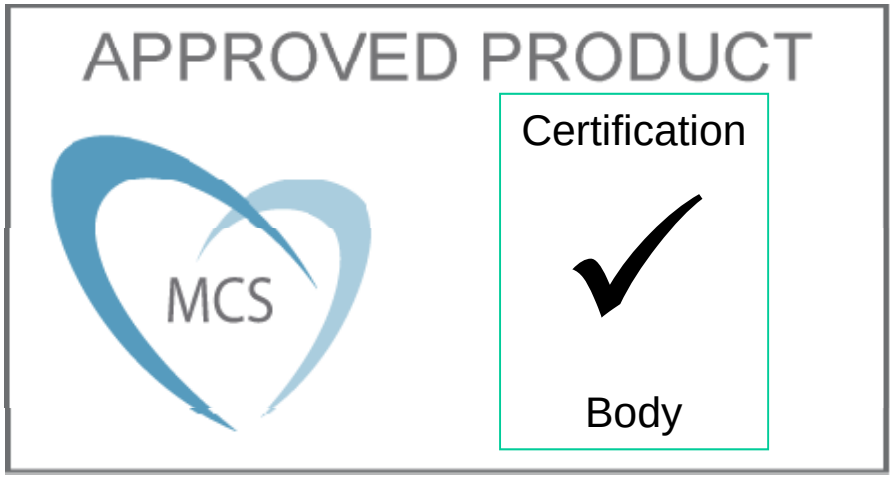
A Mark of Quality





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Renewable Heat Incentive

- Proposed scheme to be in place April 2011 & ***grandfathered***
- ***RPI, index linked***
- Up to 5MW thermal and open to at least 2020
- ***12% ROI*** all technologies ***except solar thermal - 6%***
- ***Deemed*** on small scale (calculated not metered)
- SAP (domestic), SBEM (commercial) & EPC (new build)
- ***No Pre-capitalisation*** (industry/banks to develop)
- Applies to ***New Build and Retrofit***. Audited by Ofgem
- Payments yearly <45kW & quarterly >45kW
- Back-dated to 15th July 2009 if certificated installer
- ***MCS up to 45 kW***

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Technology	Scale	Tariffs (pence/kWh)	Tariff lifetime (years)
Solid Biomass	Up to 45kW	9.0	15
Biodiesel	Up to 45kW	6.5	15
Bio gas	Up to 45kW	5.5	10
Ground source heat pumps	Up to 45kW	7.0	23
Air source heat pumps	Up to 45kW	7.5	18
Solar thermal	Up to 45kW	18	20
Solid biomass	45kW-500kw	6.5	15
biogas	45kW-500kW	5.5	10
Ground source heat pumps	45kW-500kW	5.5	20
Air source heat pumps	45kW-500kW	2.0	20
Solar thermal	45kW-500kW	17	20
Solid biomass	500kW and above	1.6-2.5	15
Ground source heat pumps	350kW and above	1.5	20

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Technology Monitoring

Field Trials

- Micro-wind
- Heat pumps
- Solar water heating
- Condensing boilers
- LED lighting
- Heating controls, Insulation
- Future…
  - Smart home energy management
  - Micro CHP

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The Heat Pump Trials

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Heat Pump Field Trials

- Heat pumps are a proven technology in Europe but relatively new to the UK
- Monitor a representative sample of ~85 in-situ domestic installations
- Calculate performance
- Investigate technical performance & customer behaviour
- Investigate potential carbon & cost savings
- Peer-reviewed methodology

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Project Funders

Site Selection

Manufacturer
Dimplex
Thermia
Nibe
IDM
IVT
Global Energy
Heat King
Baxi
Ecodan
Daikin
Daalderop
Worcester Bosch
ERW
Calorex
Kensa

Source
Air
Borehole
Slinky
Aquifer
Exhaust Air
Pond
Ground Panels

Sink
Underfloor
Air Blown Heating
Radiators
DHW
Space Heating Only

Property Type
1 Bed Semi Bungalow
3 Bed Semi House
4 Bed House
3 Bed House
1 Bed Flat
Barn Conversion

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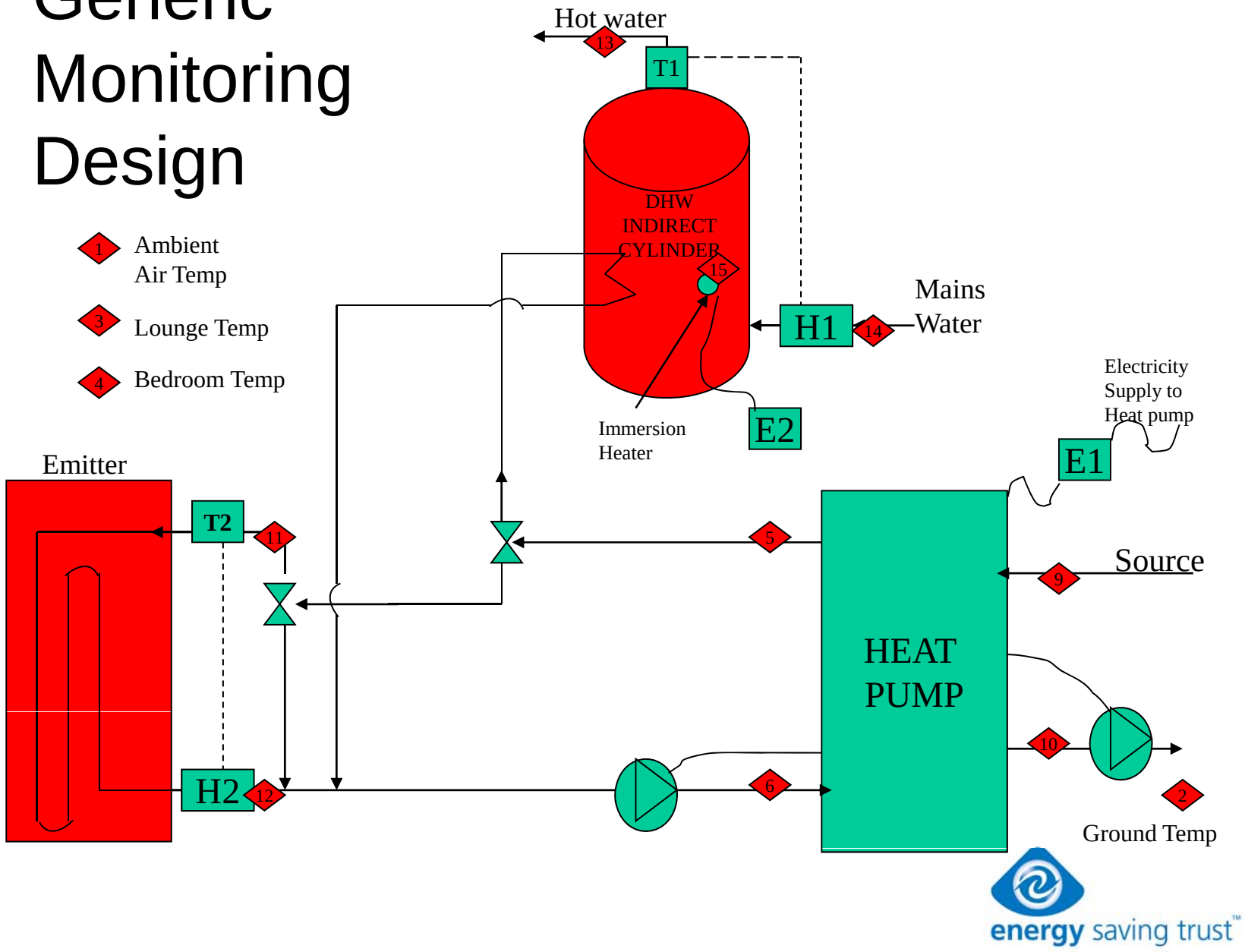
Generic Monitoring Design



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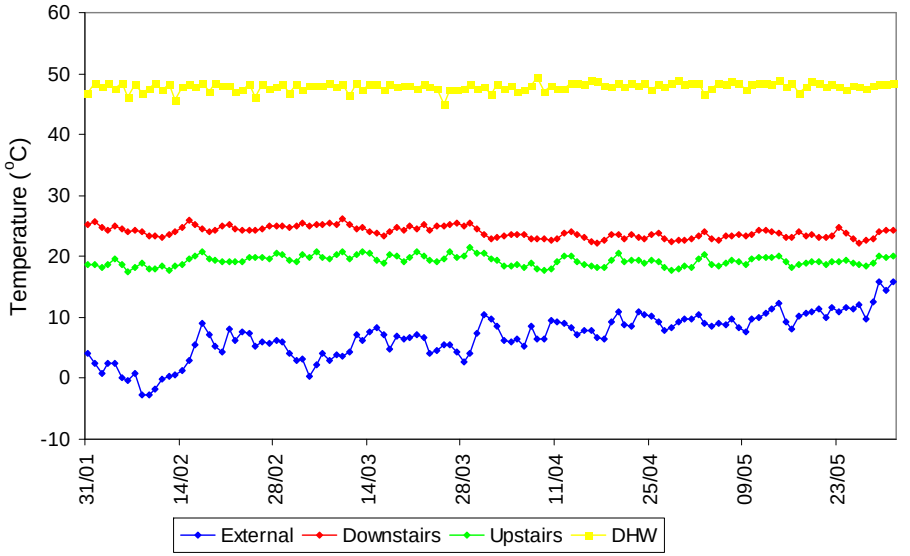
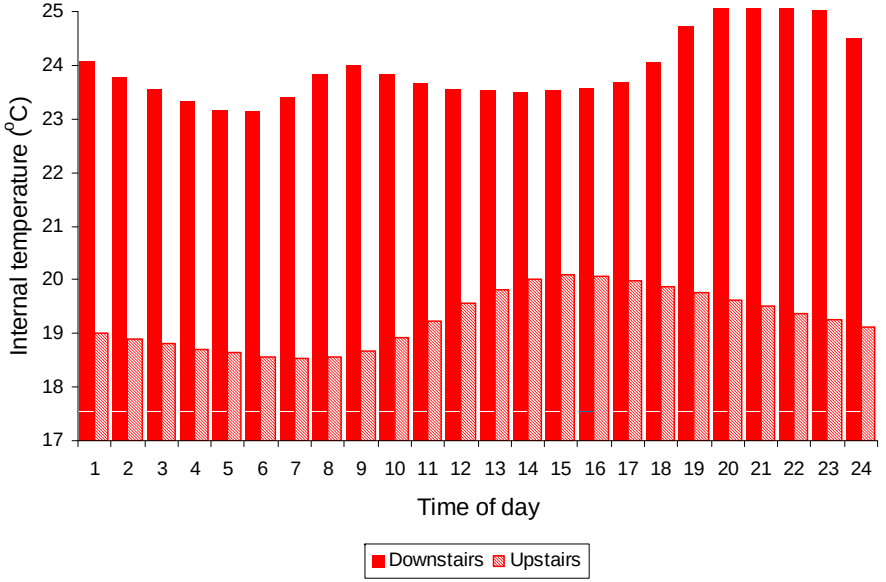
Temperature measurements

- 2x internal air temperatures
- External temperature
- DHW temperature
- Customer satisfaction with temperatures





System boundaries

- Agreed in discussion with UK and EU experts
- 4 variables reported
  - Coefficient of Performance
  - Seasonal Performance Factor
- For both Heat Pump and whole system

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Peer Review

- Roger Nordman
  - SP Technical Institute of Sweden (SEPEMO co-ordinator)
- Fabrice Rognon
  - Planair Consulting (formerly of the Swiss Federal Office of Energy)
- Marek Miara
  - Fraunhofer Institute, Germany
- Energy Technologies Institute
- Wide consultation with relevant stakeholders

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Timeline

What	When
Data analysis complete	Fri 14th May
EST to send draft report to funders & peer review	Thu 27th May
EST to develop key messaging	w/c 1st June
Peer review received	Thu 10th June
Steering group meeting	Fri 11th June
Public and technical report complete	25th June
Briefing of EST staff	w/c 28th June
Formal consultation with key stakeholders	w/c 5th July
Prepare for launch - Handover to Comms, and press teams	w/c 12th July
Publish final report	**By 31st July**

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Thanks

Questions?

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