



Emerging trends in heat pump technology



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- use of natural refrigerants
- eco – labelling
- role of ground source heat pumps for building schools for the future



SHERHPA
Sustainable Heat and Energy Research
for Heat Pump Applications

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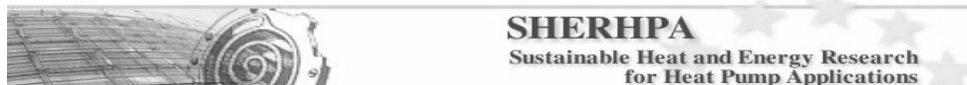
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use of natural refrigerants

- developing next generation of heat pumps using natural rather than man made refrigerants
- involves use of propane, carbon dioxide or ammonia to reduce global warming potential and ozone depletion potential of manmade refrigerants
- 11 systems developed in 7 countries with field trials started in 2006
- FP6 project SHERPHA involved 31 partners from 13 countries including 8 heat pump manufacturers

www.ehpa.org



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design characteristics

- hydrocarbons
 - similar operating conditions
 - minimise fluid inventory for safety
 - adapt compressor and lubricant
- ammonia
 - low mass flow rate
 - minimise fluid inventory for safety
 - change components (no copper)
- carbon dioxide
 - transcritical cycle
 - high pressure
 - change components and control strategy





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detailed design

- select the most appropriate type of heat exchanger for the system
- select a suitable compressor by involving the manufacturer directly to ensure comparable durability to compressors with man made refrigerants
- optimise flow rates and minimise charge particularly if natural refrigerants is toxic
- ensure that the appropriate levels of safety are fitted
- select a control strategy most appropriate to the range of applications with which the heat pumps will be used





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commercial and industrial applications

- applications considered and demonstrated by Sherhpa partners
- heat recovery from exhaust air (Delta Air)
- heat recovery from waste water (Geosolar)
- reheat process water (Sodru)
- space heating – 100 kW (Hiref)
- hot water up to 90C (Heliotherm)





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EU eco-label – main criteria

- efficiency in heating mode (COP)
- efficiency in cooling mode (EER)
- type of refrigerant (15% concession natural refrigerants)
- documentation including information fiche for installer
- installer training



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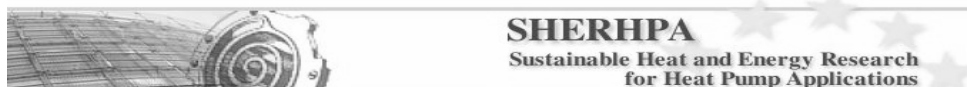


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EU eco-label – information fiche for customers

- completed by competent installer prior to sale
- reducing heat loss and solar gain
- description of existing heating system / building
- recommendations for upgrading building insulation
- recommendations for heat pump systems



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carbon content of electricity

- Eurelectric recognises the need to reduce the carbon content of electricity by 50% or more by 2050
- such a strategy will enable the electricity supply industry to meet its Kyoto targets
- a further reason for the industry to reduce the carbon content is the ever rising price of oil and gas due to growing shortages between demand and supply
- thus CO₂ emissions of electricity associated with use of heat pumps will also decrease by a factor of 2



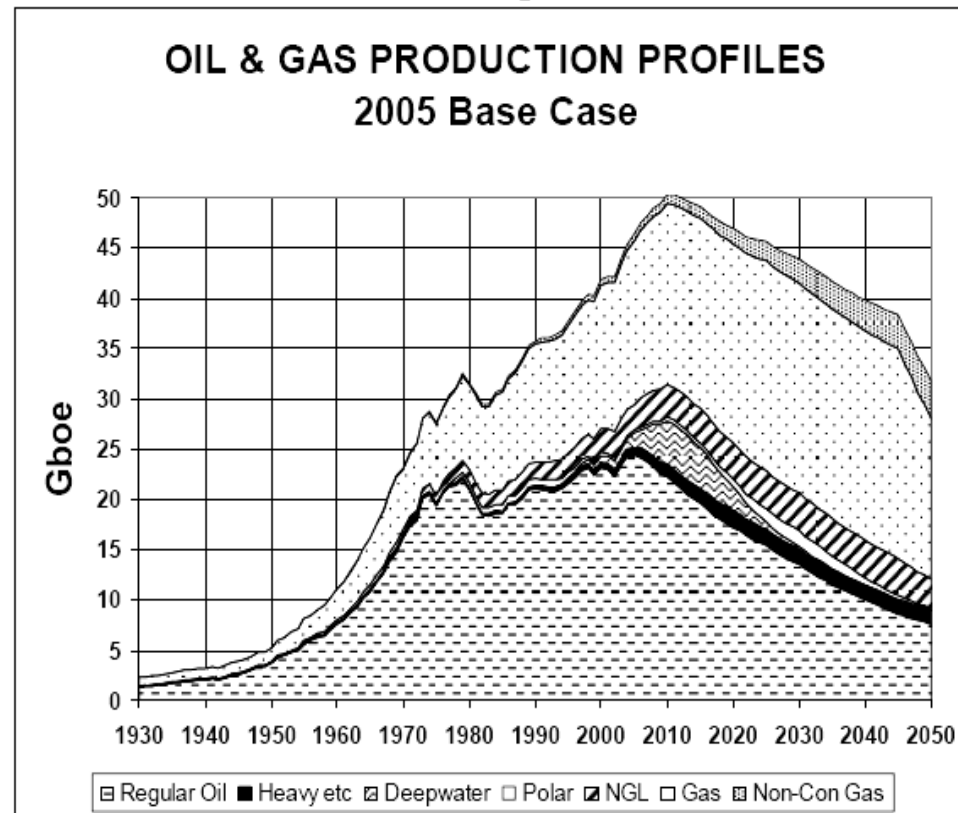


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peak oil and gas

The General Depletion Picture



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reducing use of fossil fuel for heating

- some 100 million homes (70% of EU housing stock) is heated by oil, gas or direct electricity
- by 2050 it may no longer be possible to use such fuels
- heat pumps will be the most cost effective for most homes as they have the lowest carbon footprint
- for low (or zero) energy homes, a small room source of heat or participating in a district heating scheme fed by a heat pump is likely to be most effective





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impact of rising energy prices

Year	oil (\$/bbl)	gas (€cents/kWh)	electricity	electricity/gas
2002	20	2.2	10	4.5
2007	100	4.4	15	3.5
2012?	200	8.0	20	2.5

since typical heat out to energy in is 4.0, heat pumps will become more and more cost effective

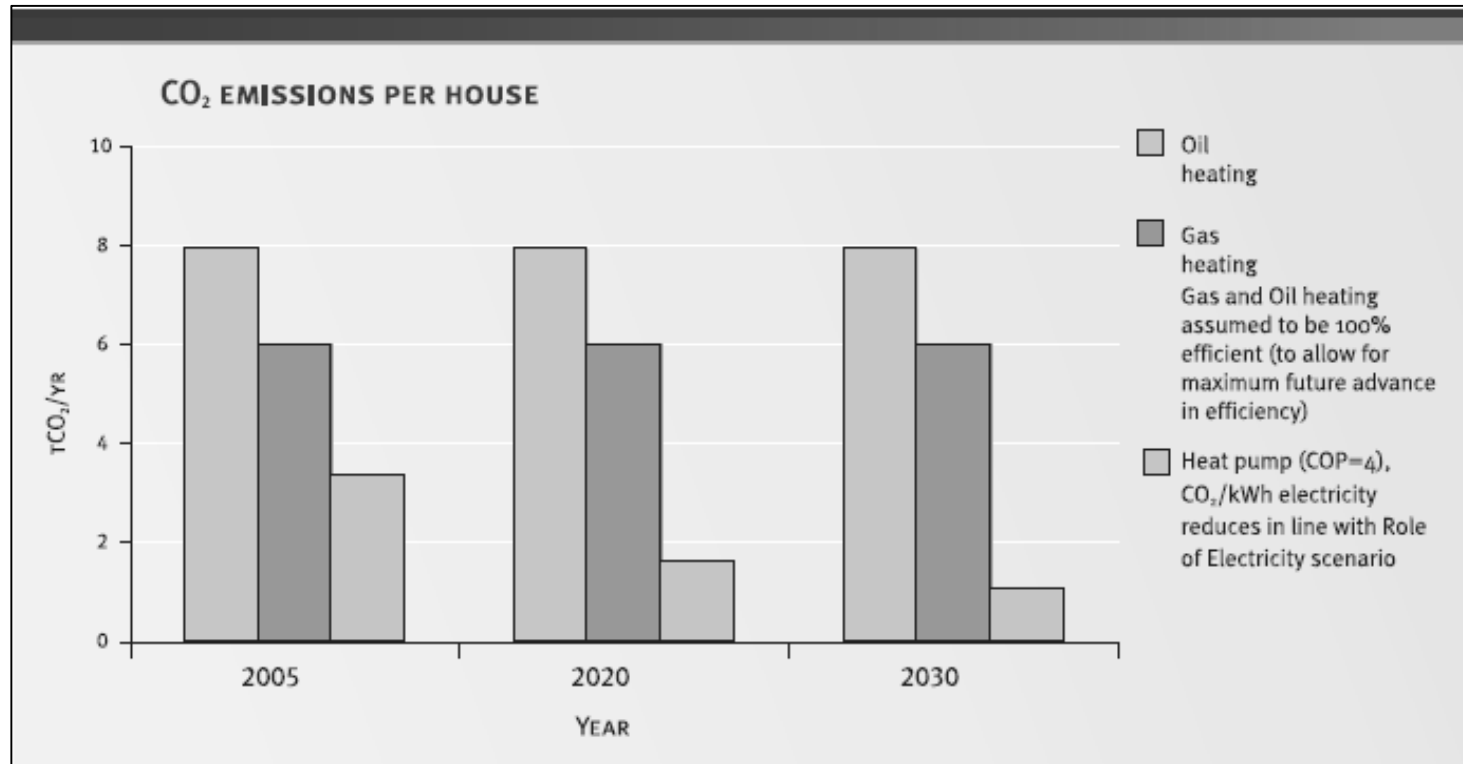




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low carbon homes





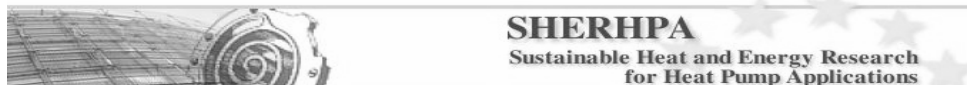
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Kyoto in the home

- small scale renewable sources attached to buildings
- EIE project to develop environmental modules for schools as part of education for sustainable development
- 50 practical activities to inform and educate students
- web based information for their parents
- to be trialled in 10 countries 2007/8
- where do they go for further advice and assistance?

www.kyotoinhome.info



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