Heat Pumps & DSR

Professor Neil J Hewitt
University of Ulster
Heat Pumps – Retrofit

- Domestic Heat Pumps

Understanding what households use?

![Graph showing thermal energy used over time](image-url)
Heat Pumps – Retrofit

- Domestic Heat Pumps
Understanding what households use?
Heat Pumps – Retrofit
- Domestic Small Heat Pumps

What are the electricity network limitations?

Further Analysis of Data from the Household Electricity Usage Study: Correlation of Consumption with Low Carbon Technologies – Element Energy, 2014
Heat Pumps – Retrofit
- Domestic Small Heat Pumps

What are the electricity network limitations?
Heat Pumps – Retrofit

- Domestic Small Heat Pumps

Assessing the Impact of Low Carbon Technologies on Great Britain’s Power Distribution Networks

HP per LV feeder type - example
(number of units deployed per 100 LV feeders)

- Suburban street
- New build housing estate
- Terraced Street
Heat Pumps – Retrofit

- Domestic Heat Pumps – Competing Loads

Diversified profiles for washing machines (WM), dishwashers (DW) and washing machines with tumble dryers (WM+TD)

Understanding the Balancing Challenge For the Department of Energy and Climate Change August 2012
Heat Pumps – Retrofit

- Domestic Heat Pumps

Capacity Management of Compressors

Capacity control of heat pumps, Per Fahlén, REHVA Journal – October 2012
Heat Pumps – Retrofit

- Domestic Small Heat Pumps

Demand Side Response (Modelled)

Heat Pump without Buffering or DSR
Heat Pumps – Retrofit

- Domestic Small Heat Pumps

Demand Side Response (Modelled)

Heat Pump with Buffering and DSR

High Temperature Heat Pump

Professor Neil J Hewitt
University of Ulster
Heat Pumps – High Temperature

- Industrial/Solar Heat Pumps
Understanding what fluids might be suitable?
Heat Pumps – High Temperature

- Industrial/Solar Heat Pumps
Understanding what fluids might be suitable?

**Coefficient of Performance @ 100°C**

- R134a
- R245fa
- HDR-14
- R365mfc
- R236fa
Heat Pumps – High Temperature

- Industrial/Solar Heat Pumps
Understanding what fluids might be suitable? HDR-14?
Heat Pumps – High Temperature

- Industrial/Solar Heat Pumps

Understanding what equipment might be suitable? R134a equipment?

Minimum evaporating temp. with:
25°C Suction Gas Return (VS)

Maximum evaporating temp.
10°C / 61.0°C
Heat Pumps – High Temperature

- Industrial/Solar Heat Pumps

Understanding what equipment might be suitable?

Fluids are not common

Is R134a equipment the best choice?

Retain pressure characteristics and temperature tolerances?