The reality of English Homes: Heating Duration, Demand Temperature, Heating Patterns

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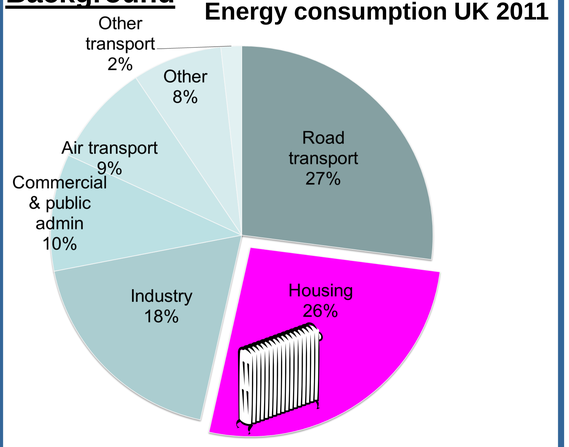
Background



Uk Government: Reduction of carbon emissions from homes by 29% by 2020 (DECC 2009).

But – what do we know about how people heat their homes?

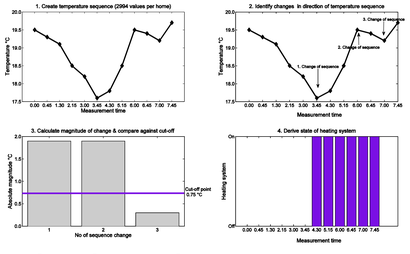
Very little!

Building stock models (BREDEM) use default assumptions about heating pattern.

Methods:

- 248 English homes with central heating.
- Socio-demographic & building variables.
- Spot living rooms temperatures measured for three winter months every 45 minutes.
- GLM, Anova, and Chi-Square for analysis.

a) Heating duration



b) Heating demand temperature

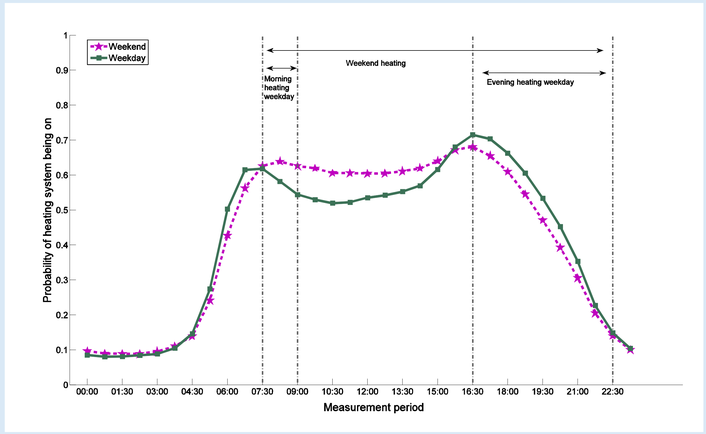
- Maximum temperature in a heating-on sequence if temperatures had reached a plateau

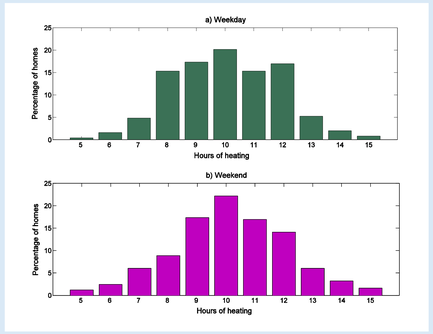
c) Cluster analysis.

Hierarchical clustering using Ward's method.

Results

a) Heating duration

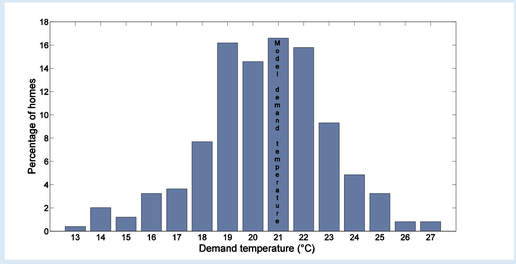




Heating duration

- Increases with age of HRP (B = 2.09 minutes) and more people in household (B = 22 minutes).
- Is higher in detached houses & bungalows and flats than in terraced houses.

b) Heating demand temperature

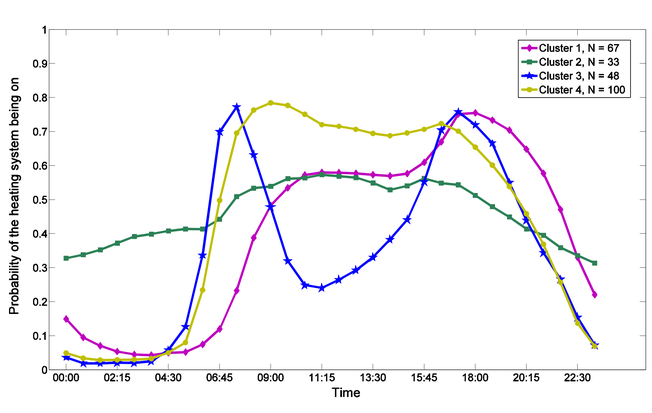


Heating demand temperatures

- Increases with higher age of HRP (B = 0.04 ˚C).
- Is lower in single households than couple or dependent children household.
- Is 20.6 ˚C on average.

Average temperature during heating 19.52˚C.

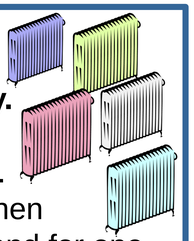
c) Clusters of heating pattern



Clusters differ in

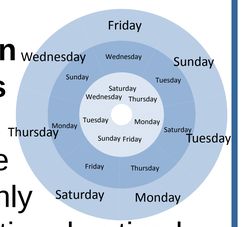
- Building type
  - 4 has more detached houses than 2
  - 3 has more terraced houses than 4
  - 2 has more flats than 4
- Operation of heating system
  - 2 more manual control than 4
- Tenure
  - 2 less owner-occupied properties
- Age of HRP
  - Lower in 2 than 4
- Heating duration
  - Lowest in 3
  - Higher in 2 and 4 than 1 and 3

Discussion



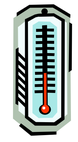
1. People heat differently.

- One size does not fit all.
- Problem: Large error when predicting heating demand for one home.
- Important for electricity-based supply.



2. Distinction between weekday & weekends superfluous.

- But: for an average week, BREDEM only overestimates heating duration by seven hours.



3. Demand temperature and temperature during heating lower than assumed.

- Overestimation of energy used.

Outlook

Better understanding of what drives heating behaviour needed in order to

- Anticipate demographic change
- Target interventions
- Design heating systems

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