



Energy Performance analysis of pre- and post-retrofit households in Greece

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Outline

1. Introduction
2. *Countdown to Low Carbon Homes* research approach
3. The survey
4. Results
5. Conclusions



Introduction /1

- Buildings consume 40 % of Europe's energy
 - ✓ energy efficiency in buildings is the most cost effective potential for emission reductions
- Growing justification and political commitment to tackle energy efficiency in buildings
 - ✓ Requires moving swiftly towards very low-energy retrofit and passive design new build en masse



Introduction /2

- Good quality and appropriate retrofit includes the following key actors and parameters
 - ✓ Home owners
 - ✓ Retrofit based on own investments
 - ✓ Unfamiliar new technologies
 - ✓ SME's doing the repair and refurbishment
 - ✓ Several financial, aesthetic, etc. barriers
 - ✓ Building suppliers, local planning and building control personnel
- Complex to achieve in practice, especially in private housing



Introduction /3

- *Countdown to Low Carbon Homes* research project
 - ✓ Partners: UK, Greece and Cyprus
 - ✓ Scope: view the construction and build environment sector of residential buildings and bring key actors together in a co-learning program
 - ✓ Conducted at local/regional level to develop a local model
- *Scope of the paper:*
 - ✓ Initial results regarding the energy performance of households in the area of Thessaloniki obtained conducting a survey
 - ✓ Results are analyzed by categorizing households in pre-retrofit and post-retrofit groups



Countdown research approach

Groups involved in the activities of the project

- *Local installer groups*: installers are included to encompass technologies required for sustainable energy retrofit of homes.
- *Post-retrofit household group*:
 - ✓ 20 households provide their experience considering retrofit. Also they record the building energy performance after retrofit.
 - ✓ An '*energy diary*' approach is established for self monitoring, encouraging also householders in the habit of monitoring consumption.



Countdown research approach

Groups involved in the activities of the project

■ *Pre-retrofit household group:*

- ✓ 20 households that intent to retrofit. Home owners are recruited for assistance with retrofit and to participate in detailed documentation of their experience.
- ✓ A home energy survey, advice, a written report on home energy performance and recommendations for energy improvements.
- ✓ ‘Hand holding’ advice is provided including finance and installers. The experience by both householder and adviser is recorded.



The survey

- ✓ In the Municipality of Thessaloniki
- ✓ Door-to-door interviews
- ✓ Scope: collect energy-data both of the pre- and post-retrofit households
- ✓ 40 residential building owners participated
 - 50 % are planning to retrofit
 - 50 % have already retrofitted
- ✓ Five sections of questions considering
 - Typological and structural characteristics
 - Heating – Cooling Systems
 - Domestic Hot Water
 - Electricity



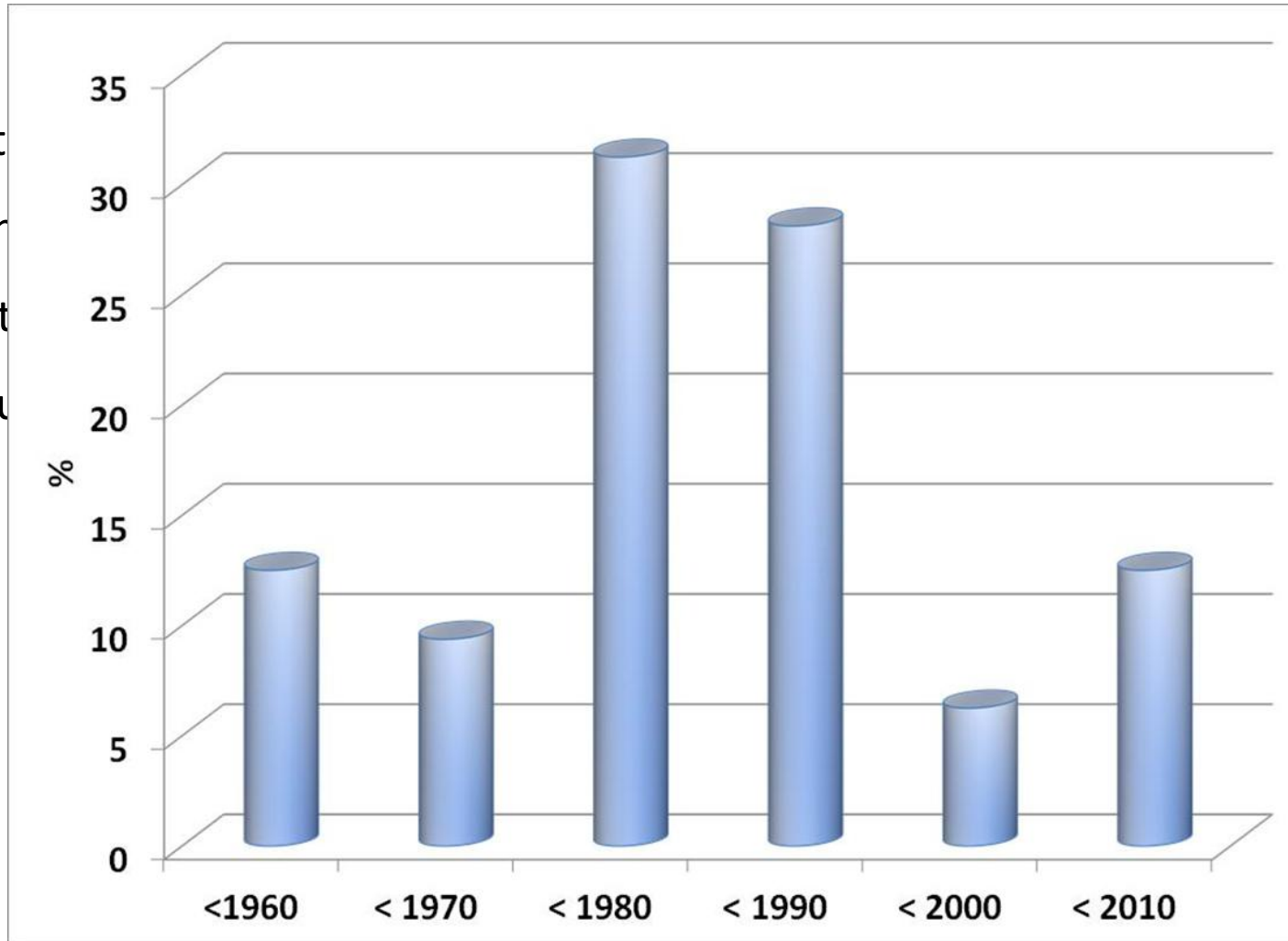
General results /1

Main characteristics of the examined households

✓ Typology

- Apartment
- Detached h
- Maissonett
- Double hou

Histogram of construction building year





General results /2

Main characteristics of the examined households

✓ Inhabitants

- One-member: 3.03 %
- Couples: 31.25 %
- Families with 3 members: 18.75 %
- Families with 4 members: 28.1 %
- Families with more than 4 members: 12.5 %

*Mean number of
inhabitants: 2.4 per
100 m²*



General results /3

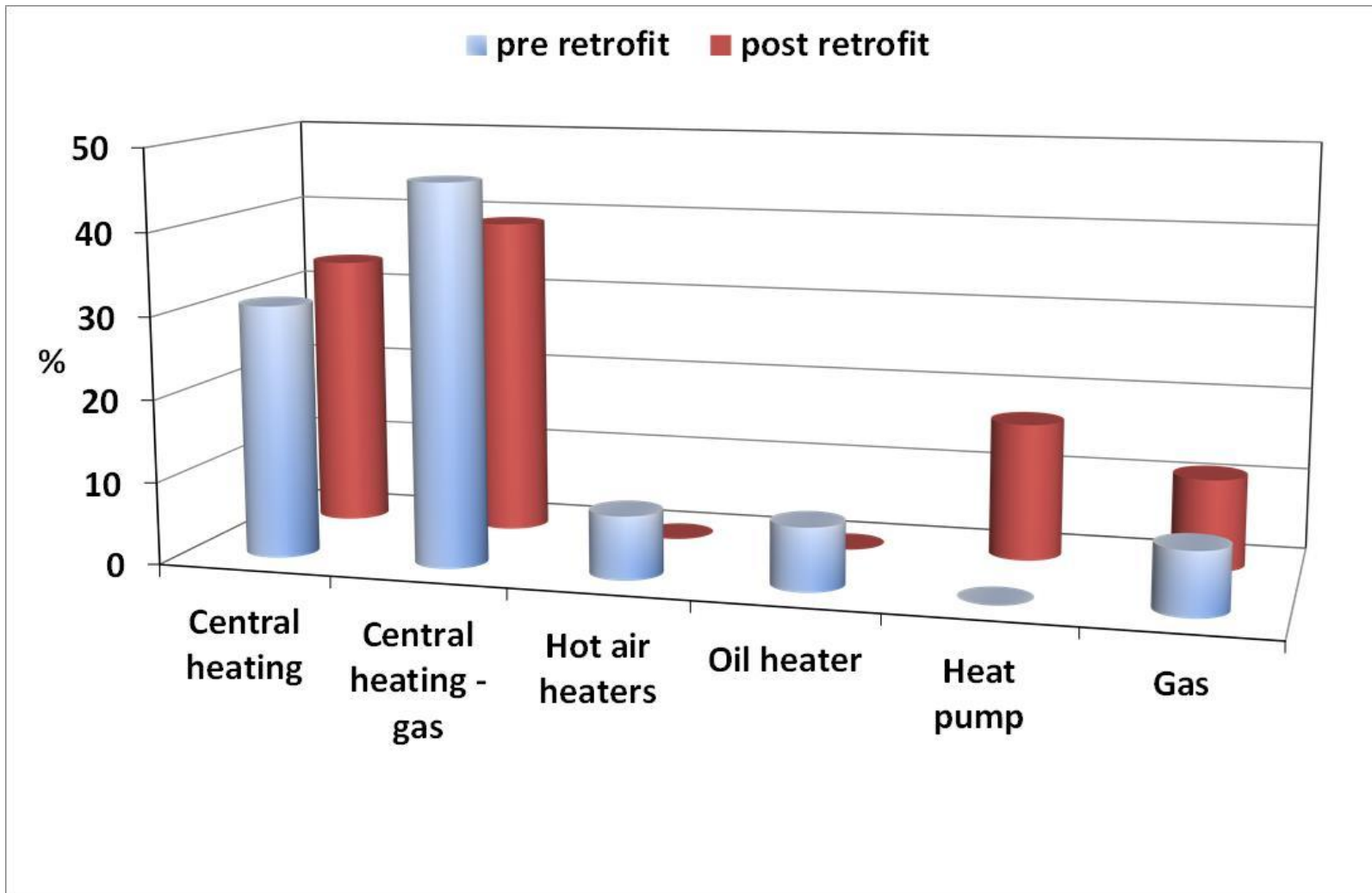
Main characteristics of the examined households

Characteristics	Mean value
Number of floors per building	3.06
Year of construction	1980
Floor area (m ²)	125.4
Inhabitants per 100 m ²	2.4



Heating Systems

Types of heating systems

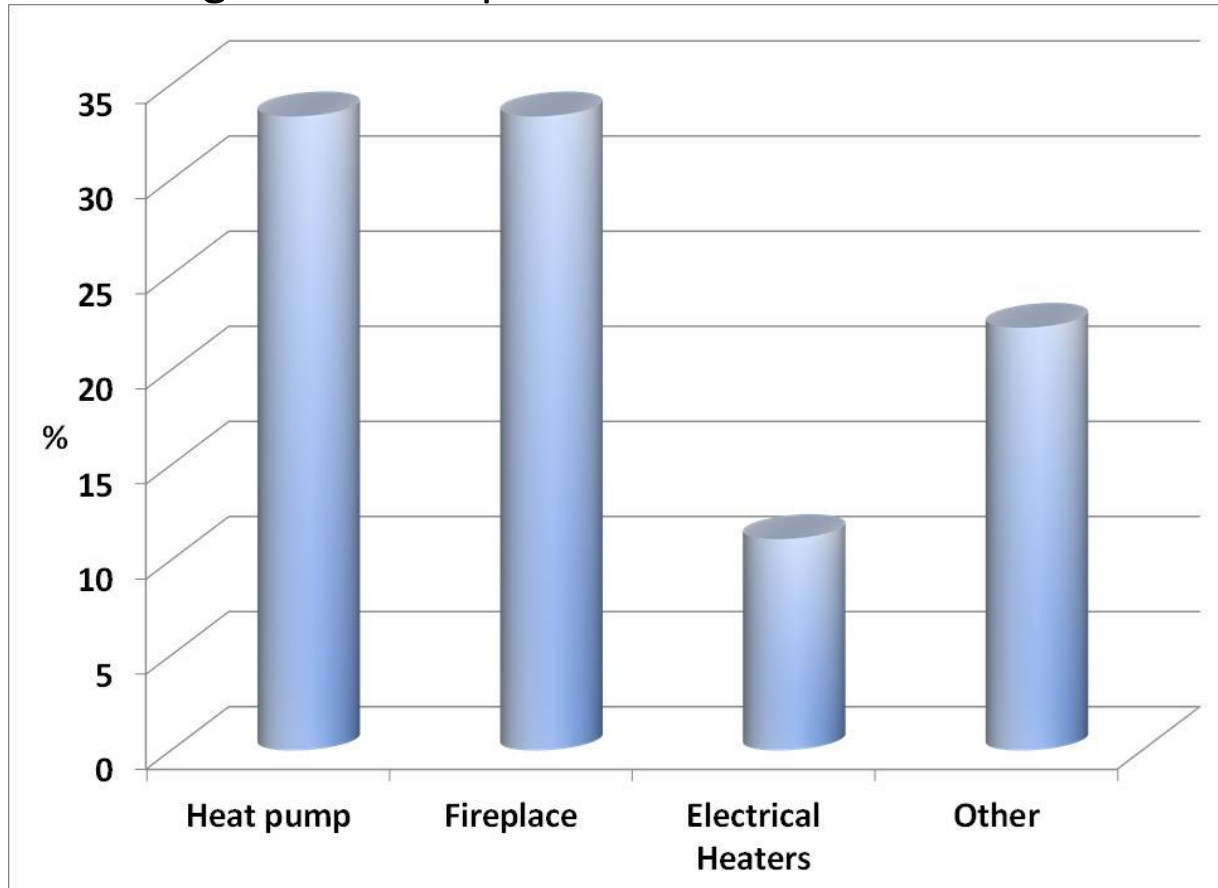




Heating Systems

Auxiliary heating systems

- 58 % of the sample
- Operate on average 2.5 hours per week





Space Cooling Systems /1

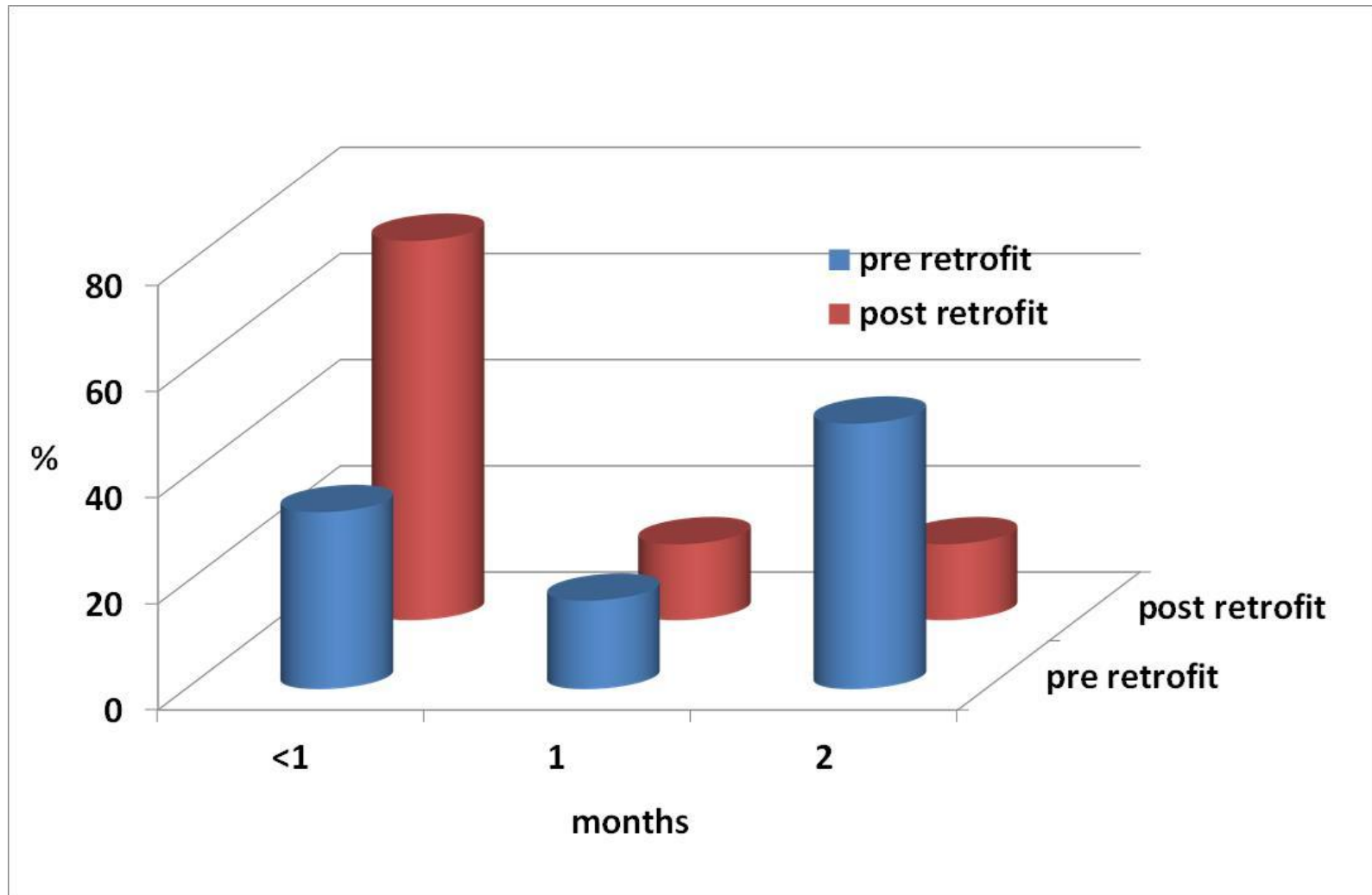
Examined sample

- ✓ Pre-retrofit group
 - 61.5 % use A/C
 - 38.5 % use roof/portable fans/ no ventilation system
- ✓ Post-retrofit group
 - 83.33 % use A/C
 - 16.66 % with no ventilation system
- ✓ A/C systems
 - Average rated power: 16,815 BTU/h
 - 50 % inverter equipped



Space Cooling Systems /2

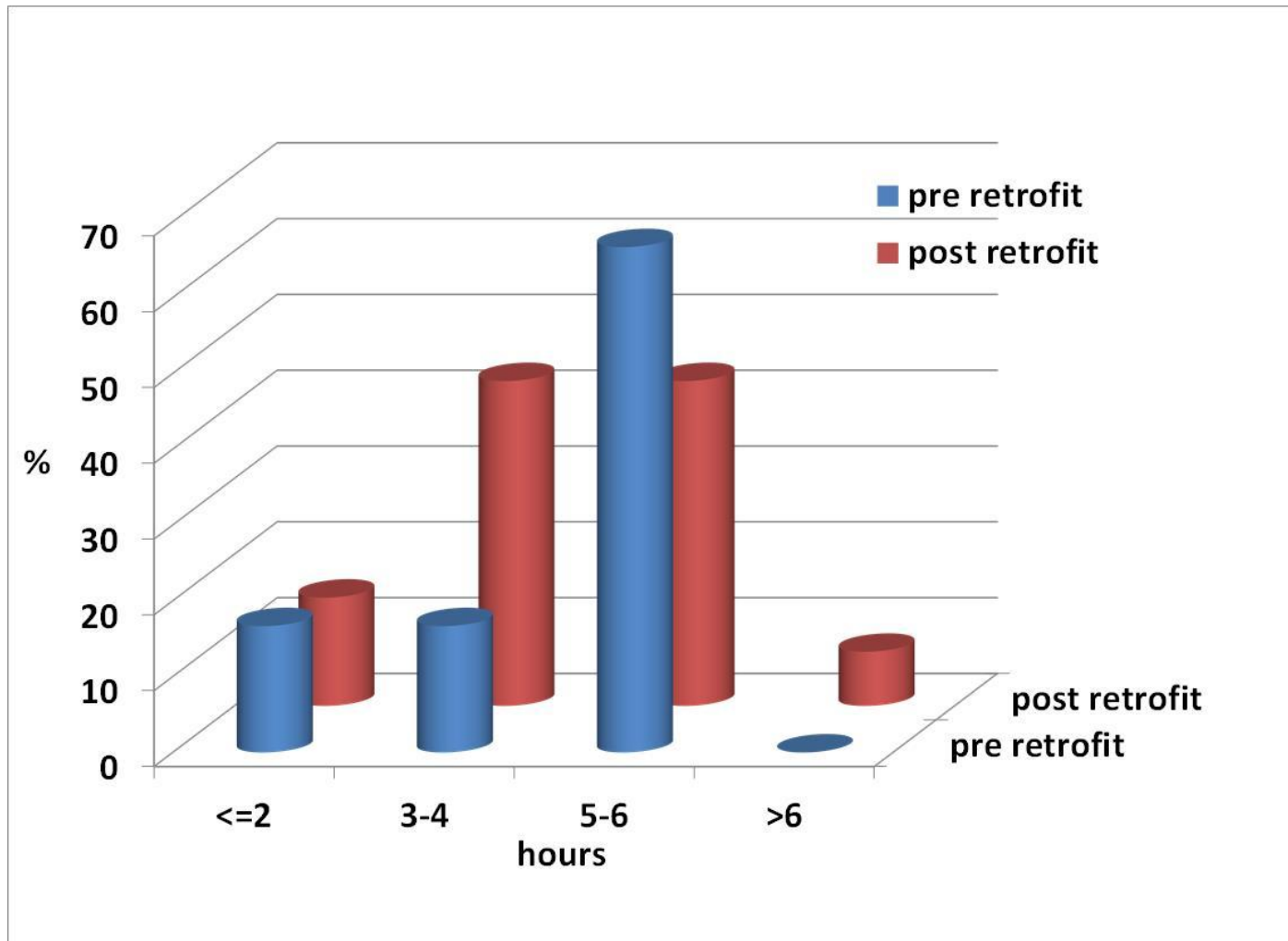
Months of operation of the A/C system during the summer





Space Cooling Systems /3

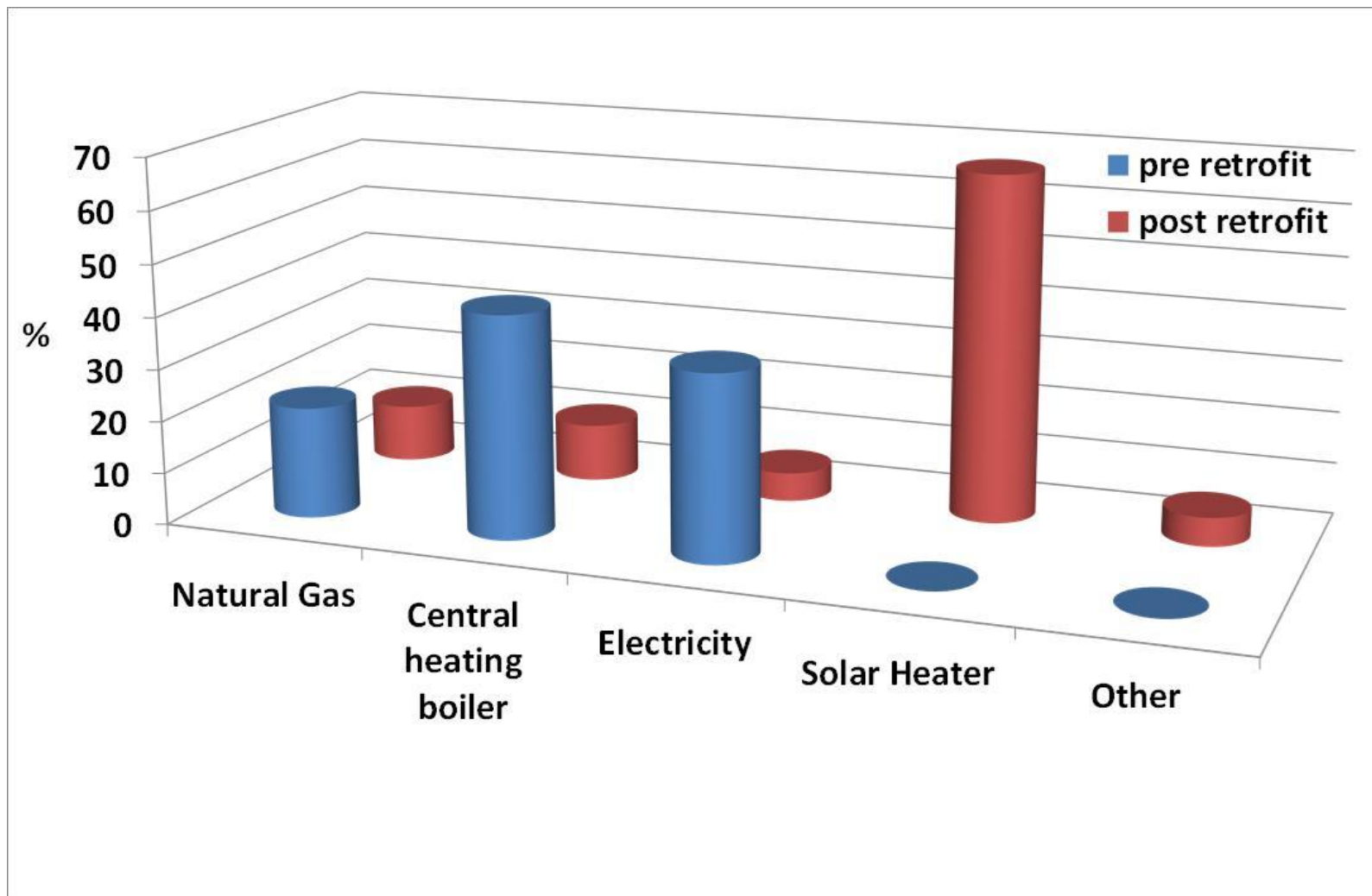
Average hours of operation per day of the A/C system





Domestic Hot Water

Primary system during the winter

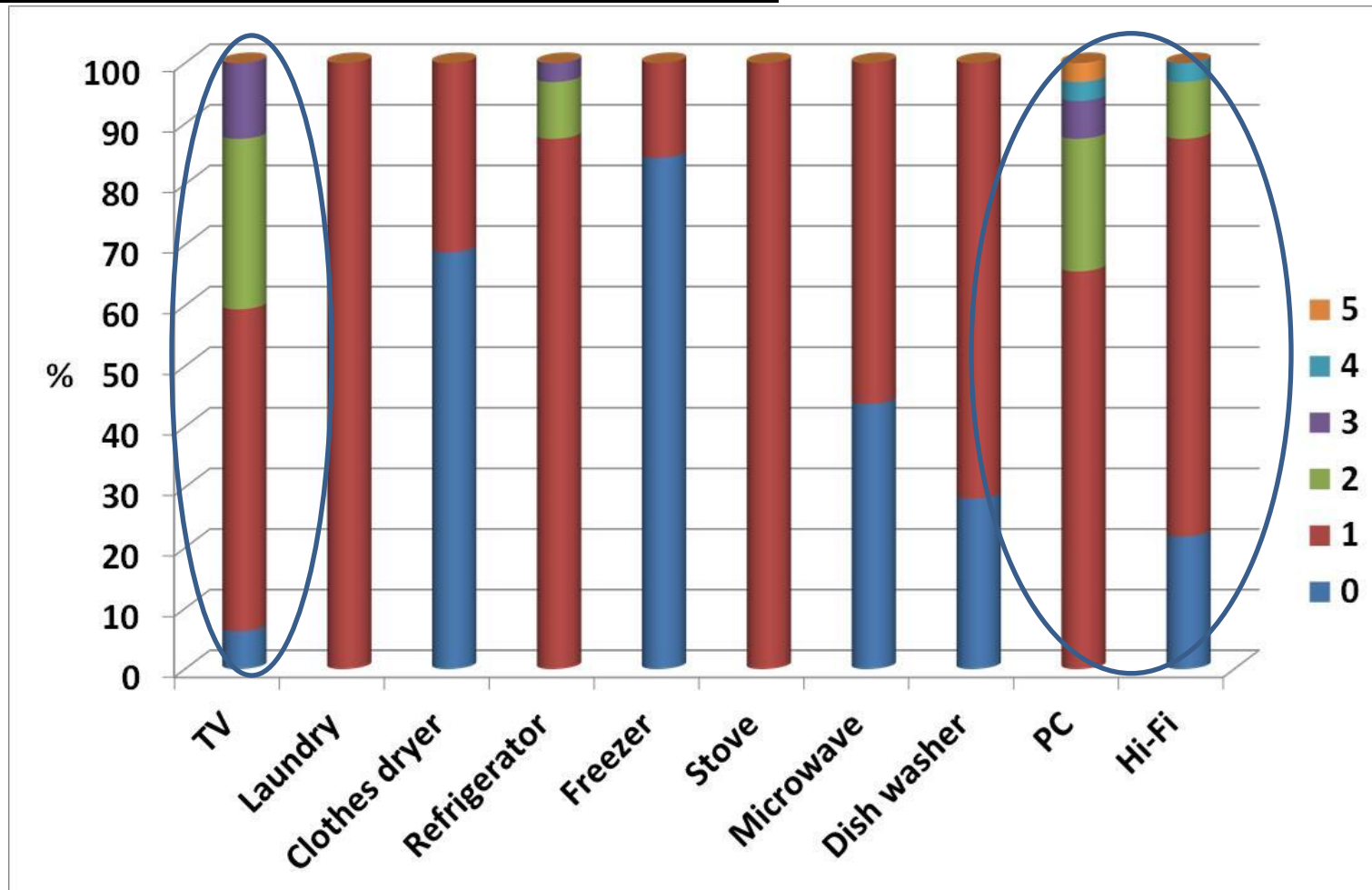




Electricity

- 60 % of households with a 3-phase supply and 40 % with single-phase

Electrical devices in the household





Conclusions

- ✓ Initial results regarding the energy performance of households *already retrofitted and intending to retrofit in the near future.*
- ✓ Survey in the framework of the research project '*Countdown to Low Carbon Homes*'
- ✓ Differences between the two household groups are observed and analyzed

Acknowledgements

Thank you very much for your attention!



COUNTDOWN
TO LOW CARBON HOMES

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