REMODECE:

Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe

Intelligent Energy Europe

CENTER FOR CLIMATE CHANGE AND SUSTAINABLE ENERGY POLICY

CENTRAL EUROPEAN UNIVERSITY

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Outline

- Background
- Main aims and expected results
- Methodology
- Electricity use in households
- Standby
- Experiences and limitations
- Output and public results
- Questions for the panel

BG3

Background

- EC Energy Efficiency Action Plan: 20-30% energy saving until 2020; ESD Directive: 1% savings per year in end-use between 2008-2016
- Hungary: 21% growth in residential electricity consumption since 1990, households are responsible for 35% of total final energy consumption
- Growth factors: increase in size and number of apartments, penetration of household appliances
- Current policy directions on standby and lighting: move from soft measures to regulation and stringency

Folie 3

BG3

check in Green Paper - and details on current vs additional policies
add info from score enerlin meeting for background
also add from Bogdan report

Boza Gergely; 18.04.2008

Main aims & expected results

- The REMODECE project aims at:
  - improving understanding of the structure and trends of domestic electricity demand,
  - assessing the saving potentials for each main appliance in the participating countries,
  - identifying and understanding underlying factors, and implications for policy making in the European Union region.
- To this end:
  - electricity end-use measurements in 100 households per country
  - national level analysis
  - common questionnaire for 500 households surveys
  - survey results used for analysis of technical and non-technical factors
  - Data added an international, public database: http://www.isr.uc.pt/~remodece/database/login.htm

BG5 participants, cut from the project annex

Boza Gergely; 18.04.2008

Methodology (1)

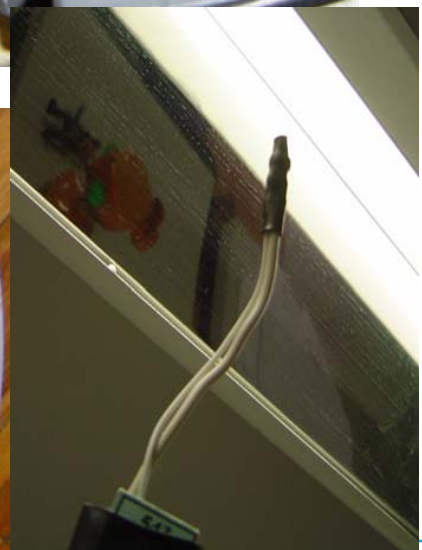
- Measurement
- Data analysis
- Survey

Methodology (2)

Measurement

- 100 households per country, overall ca. 1500 households throughout Europe
- Main appliances and lighting measured
- First such metering in CEE
  - Long term:
    - Enertech equipment
    - 2 weeks minimum, 10 minutes logging
    - Main appliances: white, wet, video/audio, computer
  - Spot: primarily for standby power information

Monitoring equipment



Methodology (3)

Data analysis

- Cold appliances
  - These appliances are operated automatically, and are less influenced by user behaviour
  - National Savings = N*(PV-BAT), where
    - Savings: TWh saved for a country per year
    - N: Number of appliances in country
    - BAT: Best available technology [kWh/year] (taken from topten)
    - PV: Present technology, common value for the appliance groups [kWh/year]

BKB3 maybe choose a better example

Boza-Kiss Benigna; 18.04.2008

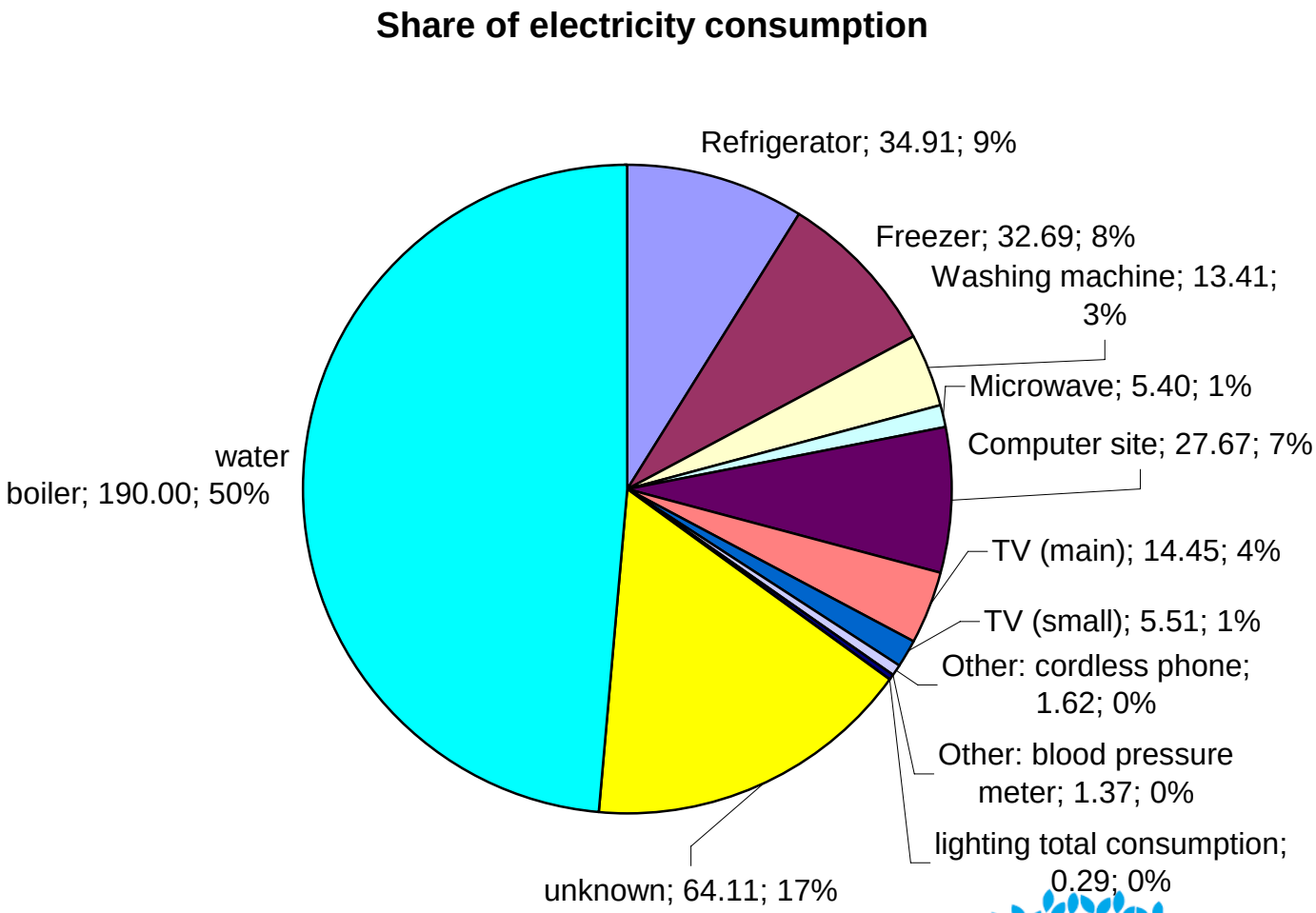
Methodology (4)

Survey

- Very detailed: 76 questions
- 100 questionnaires from metered households
- 400 questionnaires from representative survey
- Topics:
  - Quantity and energy use of main appliances (cool, washing, cooking, office, home entertainment, air conditioning) and lighting
  - Behavioural questions (ex: frequency of defrosting of freezer, knowledge of energy labels)
  - Demography and background

    (ex: electricity consumption)

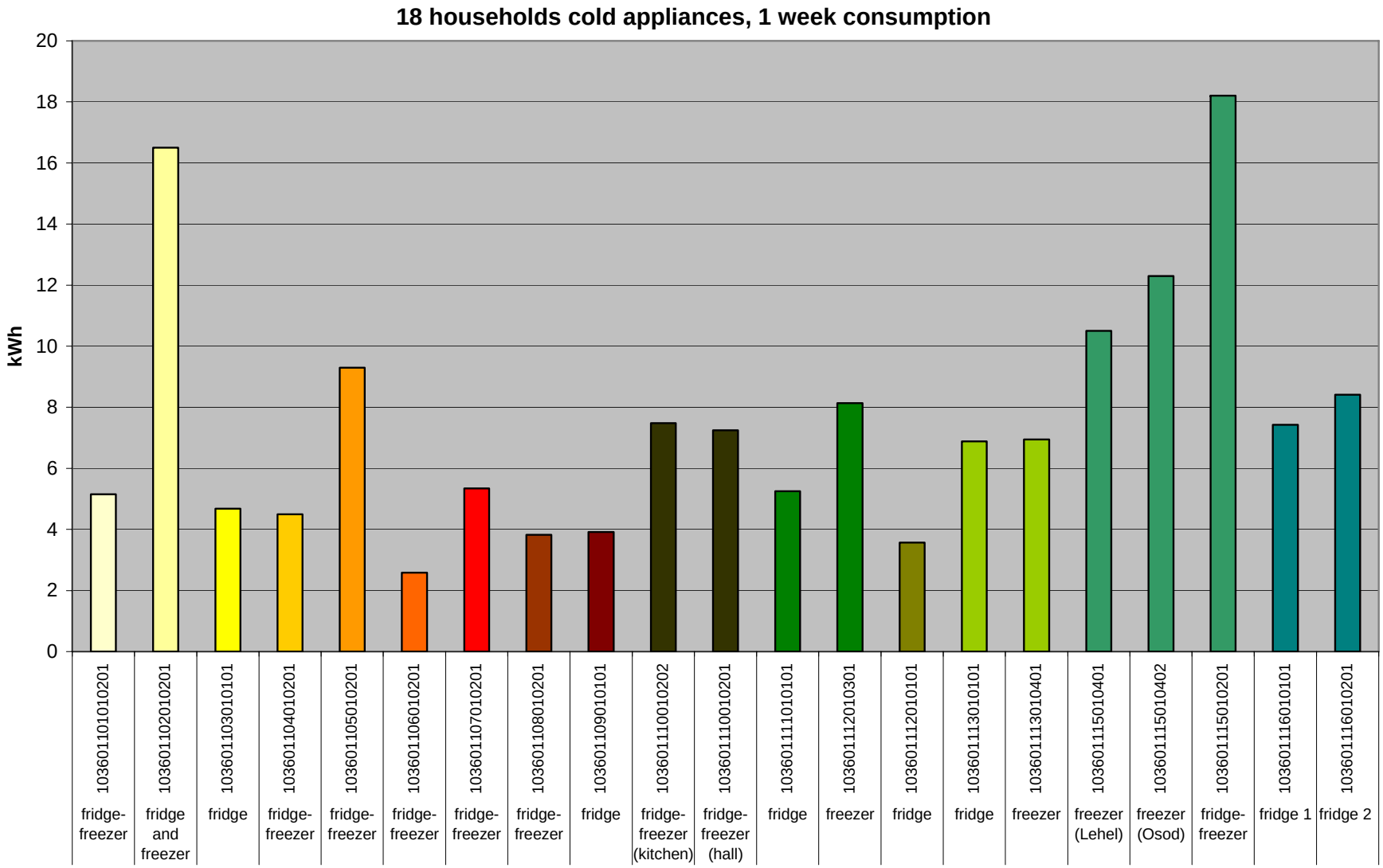
Relative electricity consumption of appliances in households



HH54, total consumption: ca. 190 kWh/m

BG6

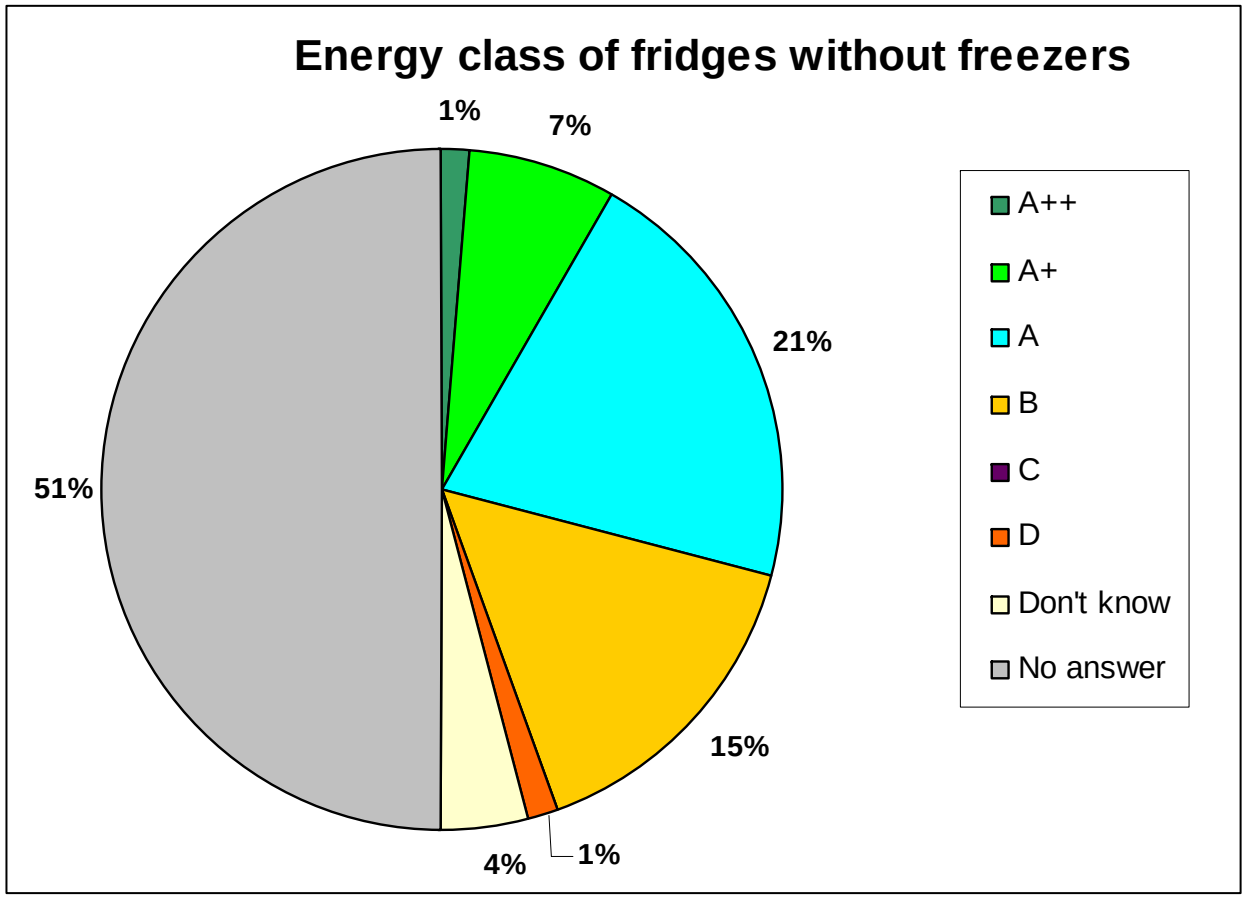
Cold appliances stock – large differences



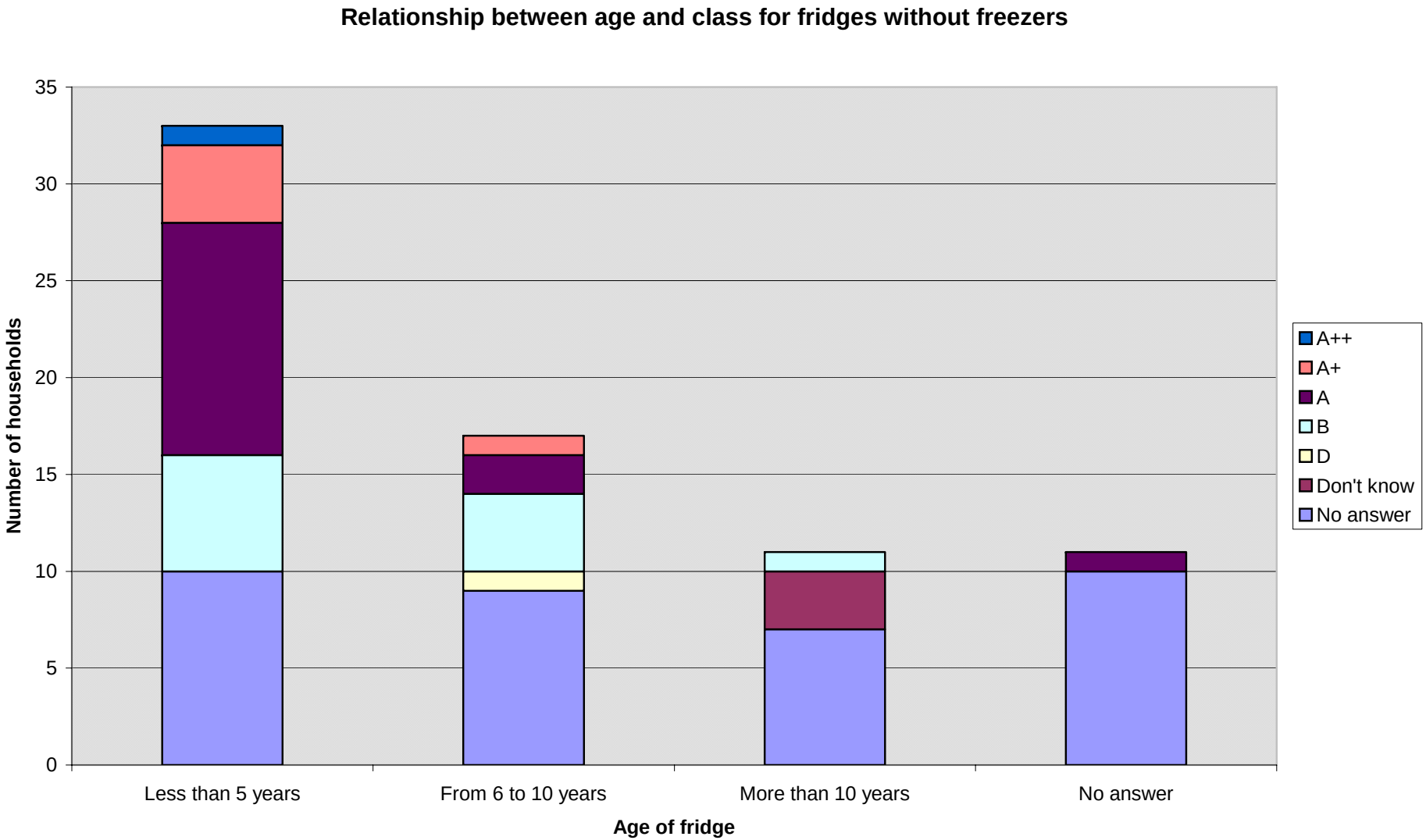
BG6 maybe try to incraese fonts?

Boza Gergely; 18.04.2008

Cold appliances – stock (1)



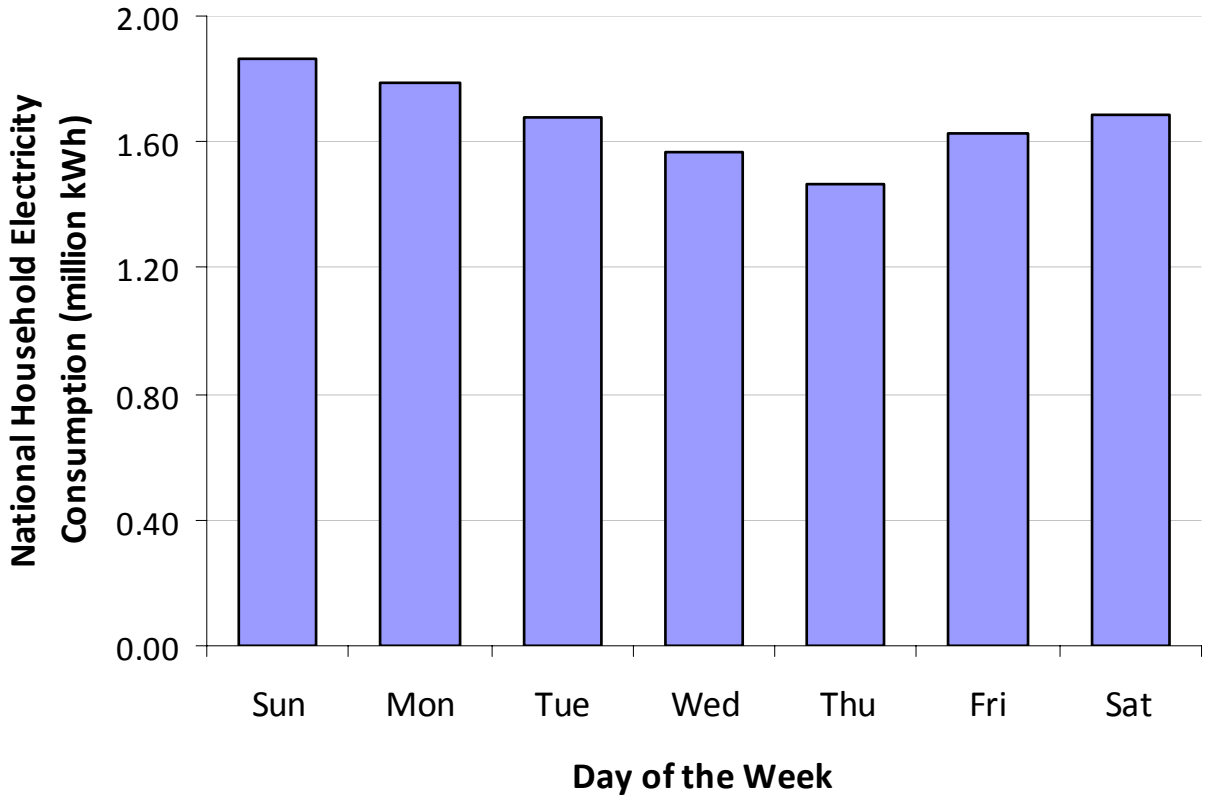
Cold appliances – stock (2)



National electricity consumption-TV

Total National Consumption:

0.85 TWh/yr



Saving potential – preliminary calculations (Czech Rep)

- Savings for an average houshold as shown in the Table
- Comparison of stock from the metering to BAT (topten)
- Savings from changing cold, lighting, PC are biggest

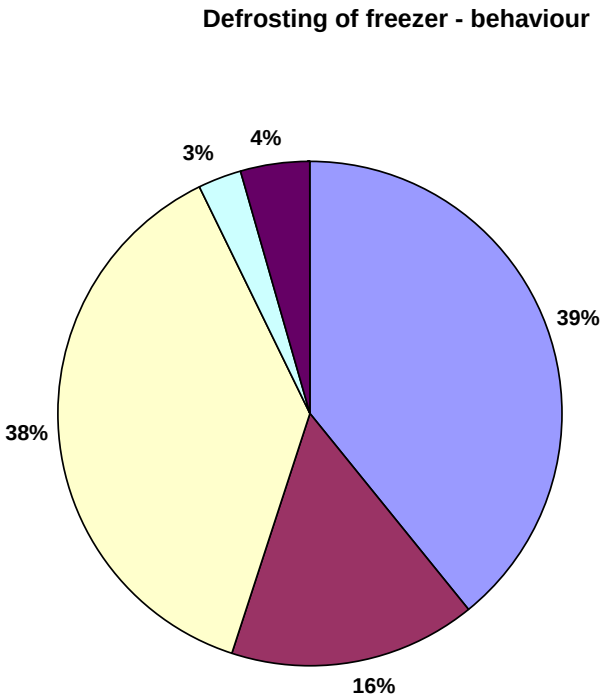
Cold appliance	Washing machine	TV	audio-visual	PC site	Lighting	Total
197.5	**6.7**	**6.7**	**8.2**	**47.7**	**72.5**	**345.2**
kWh/yr	kWh/yr	kWh/yr	kWh/yr	kWh/yr	kWh/yr	kWh/yr

Based on data from Vorisek, 2008

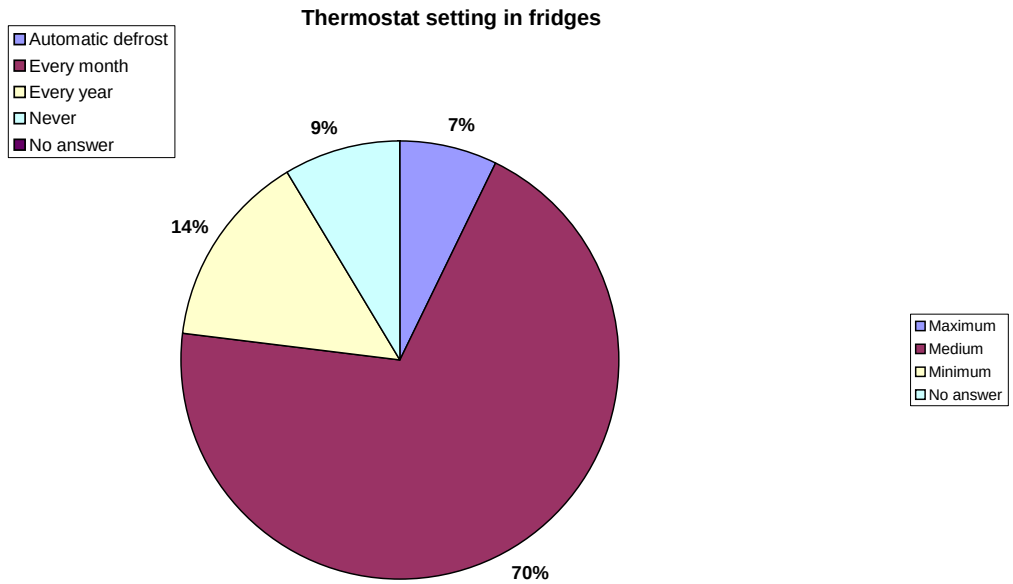
Survey – preliminary results (1)

- Lack of data on energy class of appliances balanced by self-declared awareness of energy labels (96% check before purchase)
- Low ownership level of less traditional equipment (tumble dryer, dishwasher, AC)

Survey – preliminary results (2)



Behaviour: thermostats set to medium



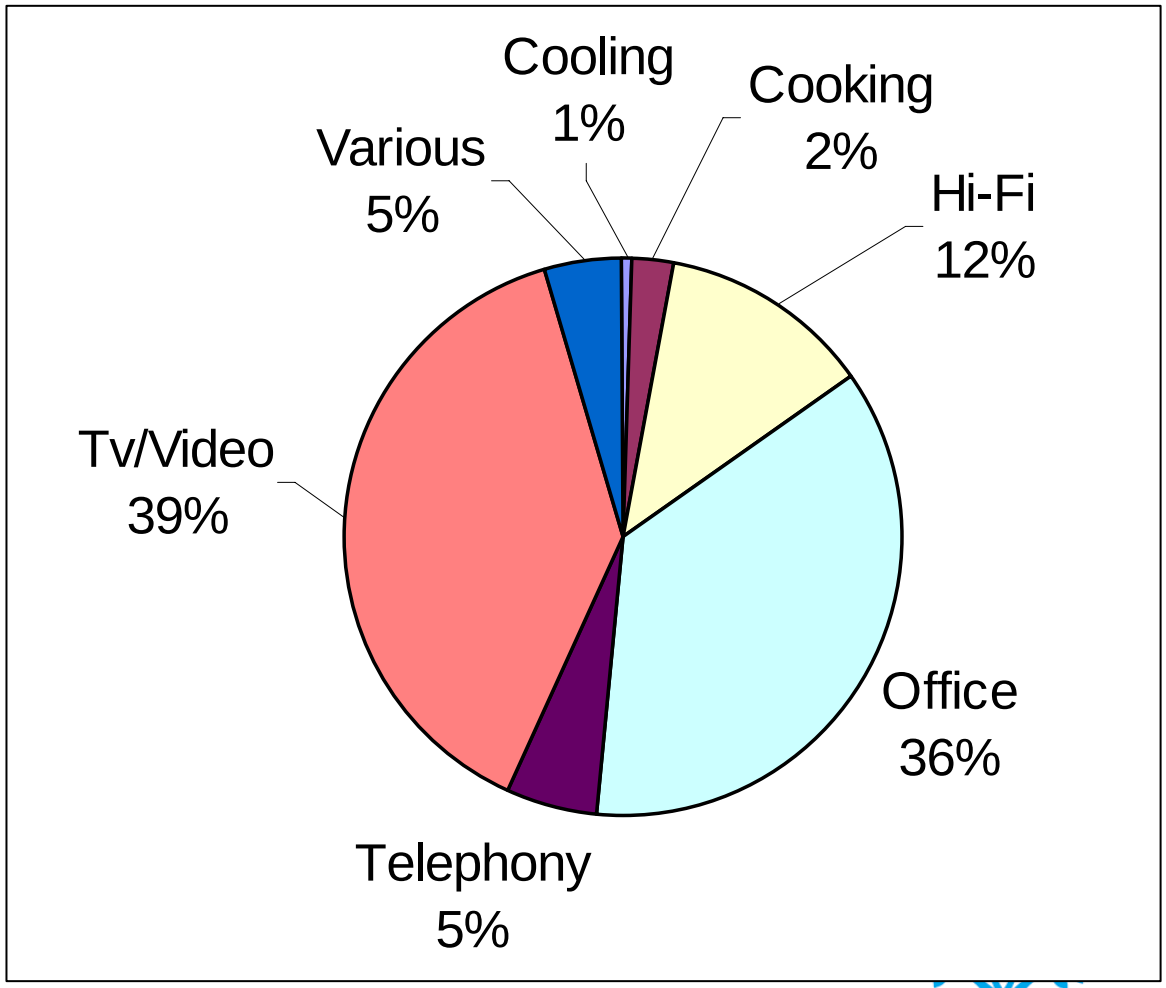
Behaviour: use of automatic defrost function, or yearly defrosting

Standby (1)

- In the metered households, the total standby consumption of the household for a year was found to be 8.2% of total annual electricity consumption.
- The average installed lopomo power in the households was 30W (with a maximum standby power reaching 110W found in one household).
- This corresponds to an average consumption of 0.65 kWh per day, and 236 kWh per year (maximum lopomo consumption being 933 kWh/year).

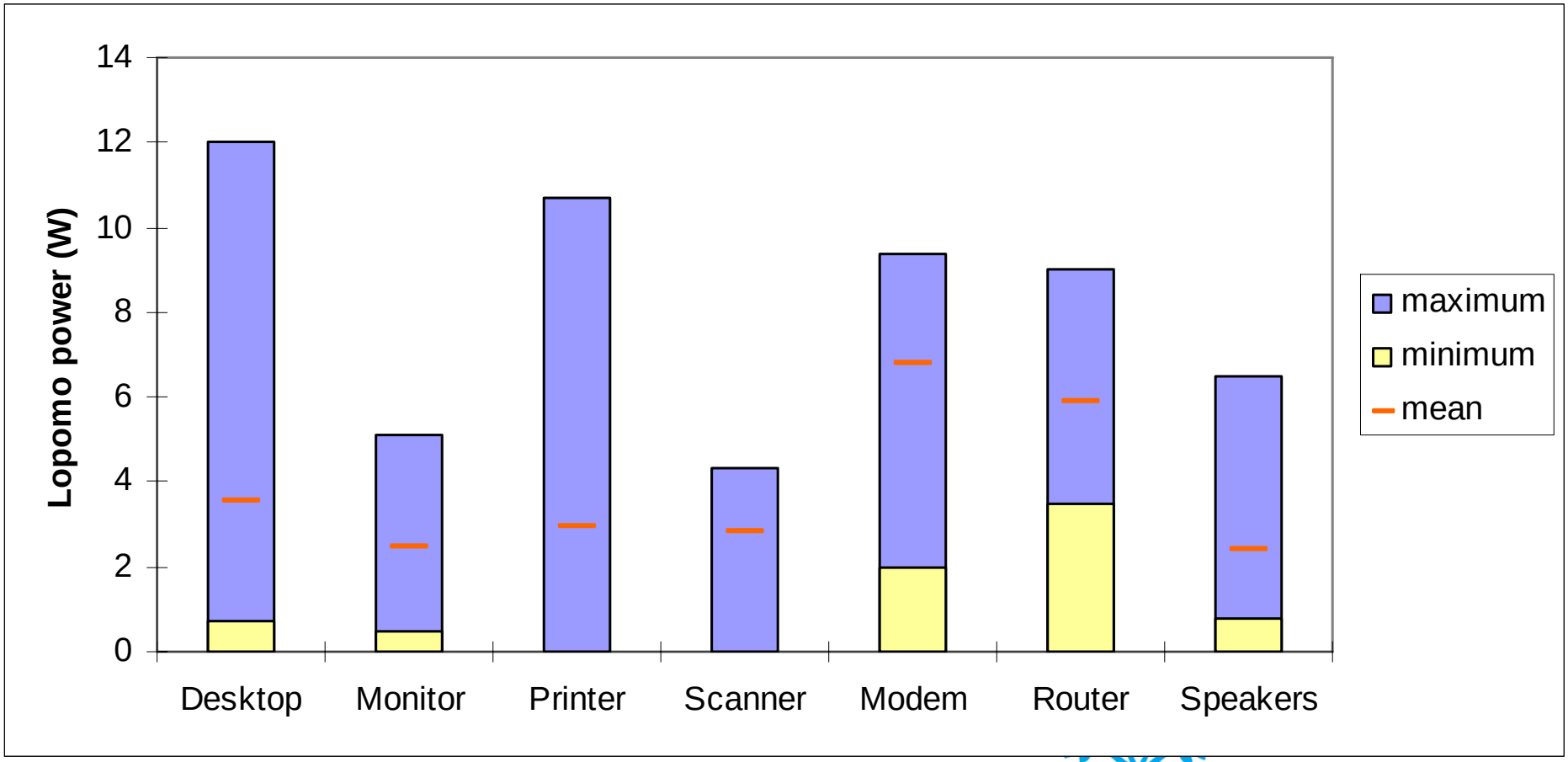
Standby (2)

Lopomo consumption per appliance category



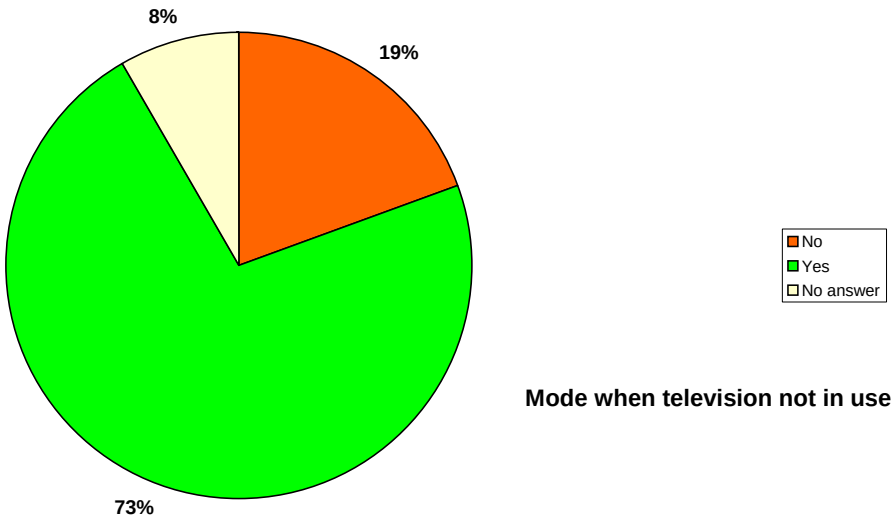
Standby (3)

Lopomo power of office equipment

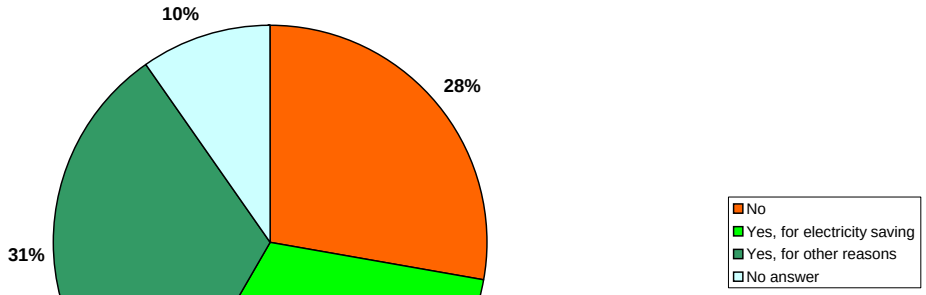


Standby (4)

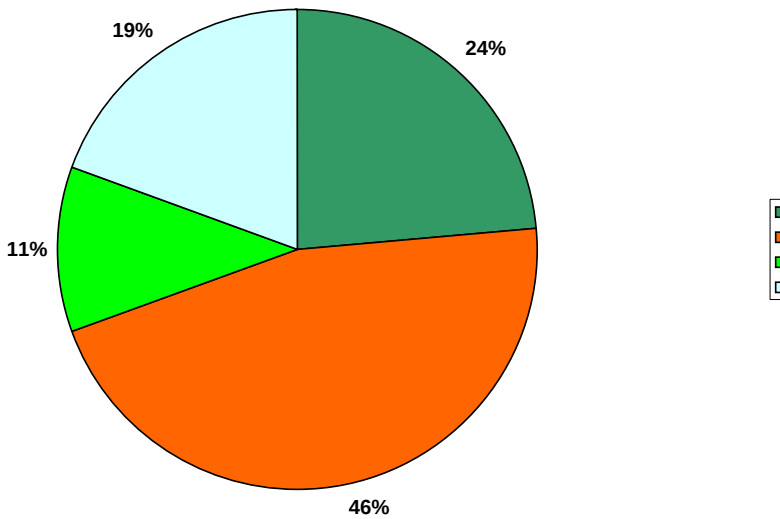
Awareness of standby electricity use



Chargers unplugged?



Mode when television not in use



Contradiction: self-proclaimed awareness of standby effect, but high percentage of TVs left on standby and chargers left on.

Leading question?

Standby (5)

Standby killer - economic evaluation

	Cost of standby killer (HUF)	Consumer's annual discount rate	Lifetime of the standby killer	Electricity savings (kWh/year)	CCE (Ft/kWh)
TV site	3000	0,2157	5	91,81	11,07
Office site	2500	0,2157	5	125,79	4,56

Source: SavePower (n.d.), MNB [2007]

1 Watt policy

Expected number of households (2020)	Potential savings (GWh/day)	Potential savings (GWh/year)	CO2 emissions reduction (per year)	% of present CO2 emissions
4078023	1,779	649.204	321.8kt	0.56

Source: data extrapolated from CSO (2005),
CO_2 conversion factor calculated from HMEW (2005) and Zürn and Fall (2005)

Electricity saving potentials in Hungarian residential sector: conclusions

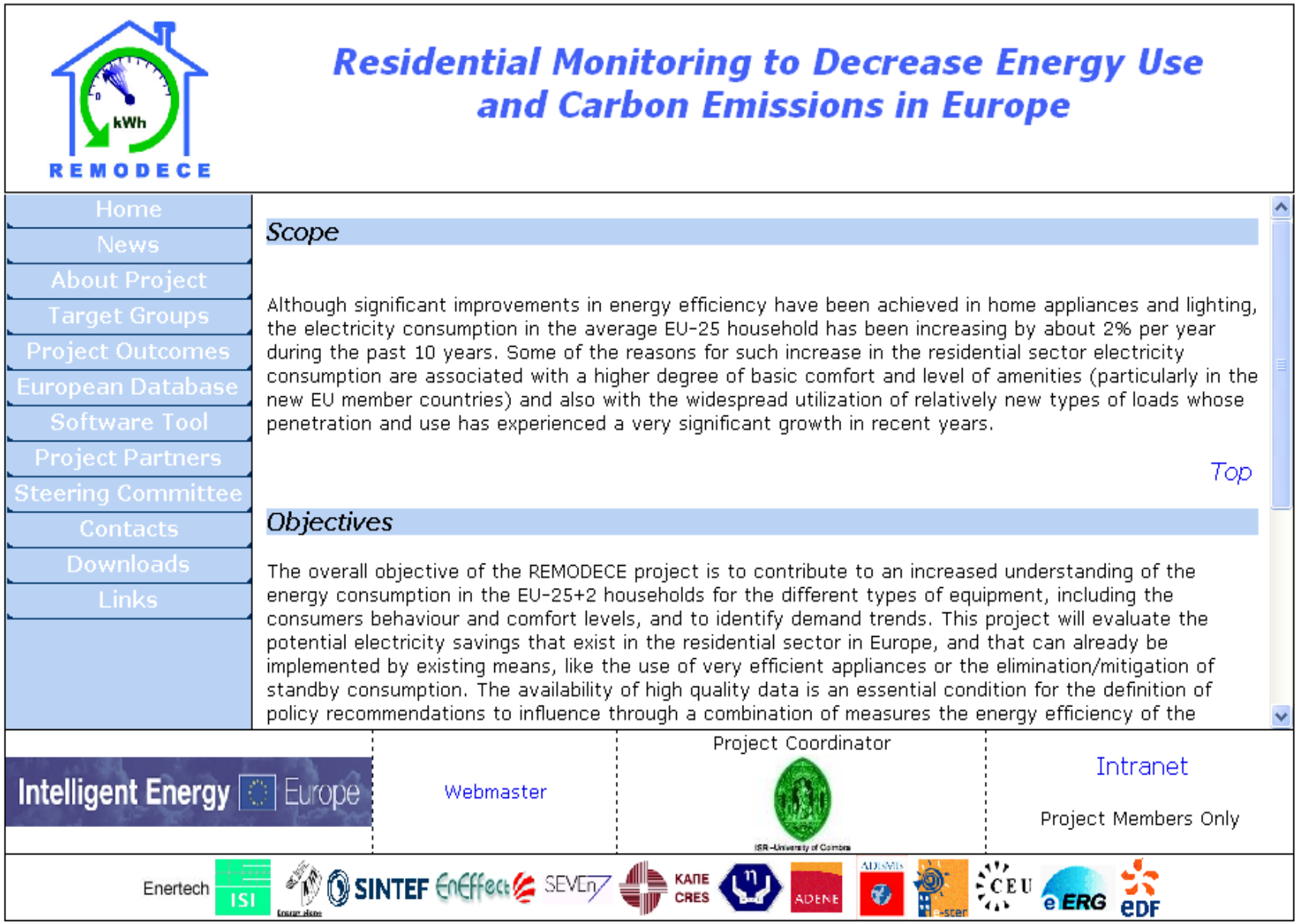
- Main consumer: cold appliances, ca. 20-30% of electricity consumption – huge differences
- Lighting is in average close to 20%, halogen is infiltrating
- Other important electricity consumers: audio-visual equipment (TV, antenna, VCR, DVD)
- If electricity is used for water heating: can be 30-40% - largely dependent on the state of the boiler (need checking)
- Standby is an important issue: almost 10%, cost of conserved energy is much lower than electricity price.
- Most important saving opportunities:

  cold, lighting, PC, standby

Experiences, limitations

- Data collection is time and resource intensive – but the data obtained and the models built on them are extremely important
- Practical imperatives can compromise scientific validity (ex: households monitored in Budapest versus the whole of Hungary - representative?)
- Behavioural analysis based on questionnaires is subject to survey bias (respondents may alter answers to ‘please’ interviewer)

Output, public results



Edit View Favorites Tools Help

Back Search Favorites

http://www.isr.uc.pt/~remodece/softwaretool/softtoolgen.php?param1=5 Go

I General questions

1 - How many people live in your home ?

children less than 6 | 0 children from 6 to 16 | 0 young people from 16 to 25 | 0 persons from 25 to 64 | 0 persons over 64

2 - Your type of household...

(•) house ( ) flat

3 - What type of energy do you use for cooking

electric stove and oven

II Cold appliances

1 - Select the type for your 1st fridge

Type : None | Size : Small (<150 l) | Age of the appliance : < 5 years

2 - Select the type for your 2nd fridge

Type : None | Size : Small (<150 l) | Age of the appliance : < 5 years

Internet

Build your query page

You can click here if you want to access the survey documents...

Use this page to build your query for the database...

Select the appliances you are interrested in from the list, add the projects and the type of data you want to extract and then click on the Search button.

Hint

Select the aplliances for which you want to obtain data and add them to the list. The list must contain at least one appliance to be able to carry out a search in the database.

Appliances

Audiovisual

Select the appliance

Add to list | Clear the list

Hint

Project and country's

(Click here to learn more about the monitoring campaigns...)

Select the project

Thank you for your attention

For more information or for comments, suggestions, please contact:

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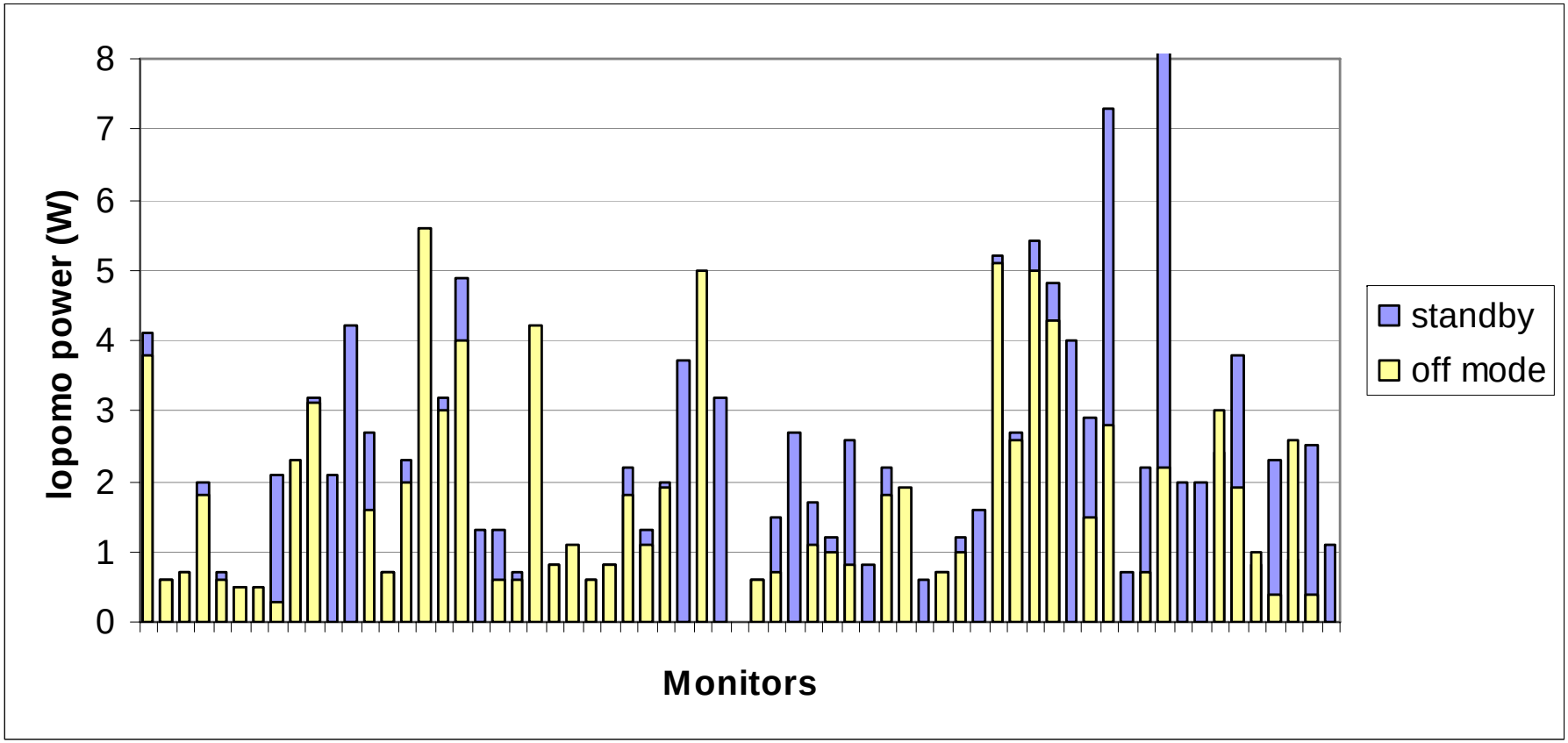
Questions for the panel

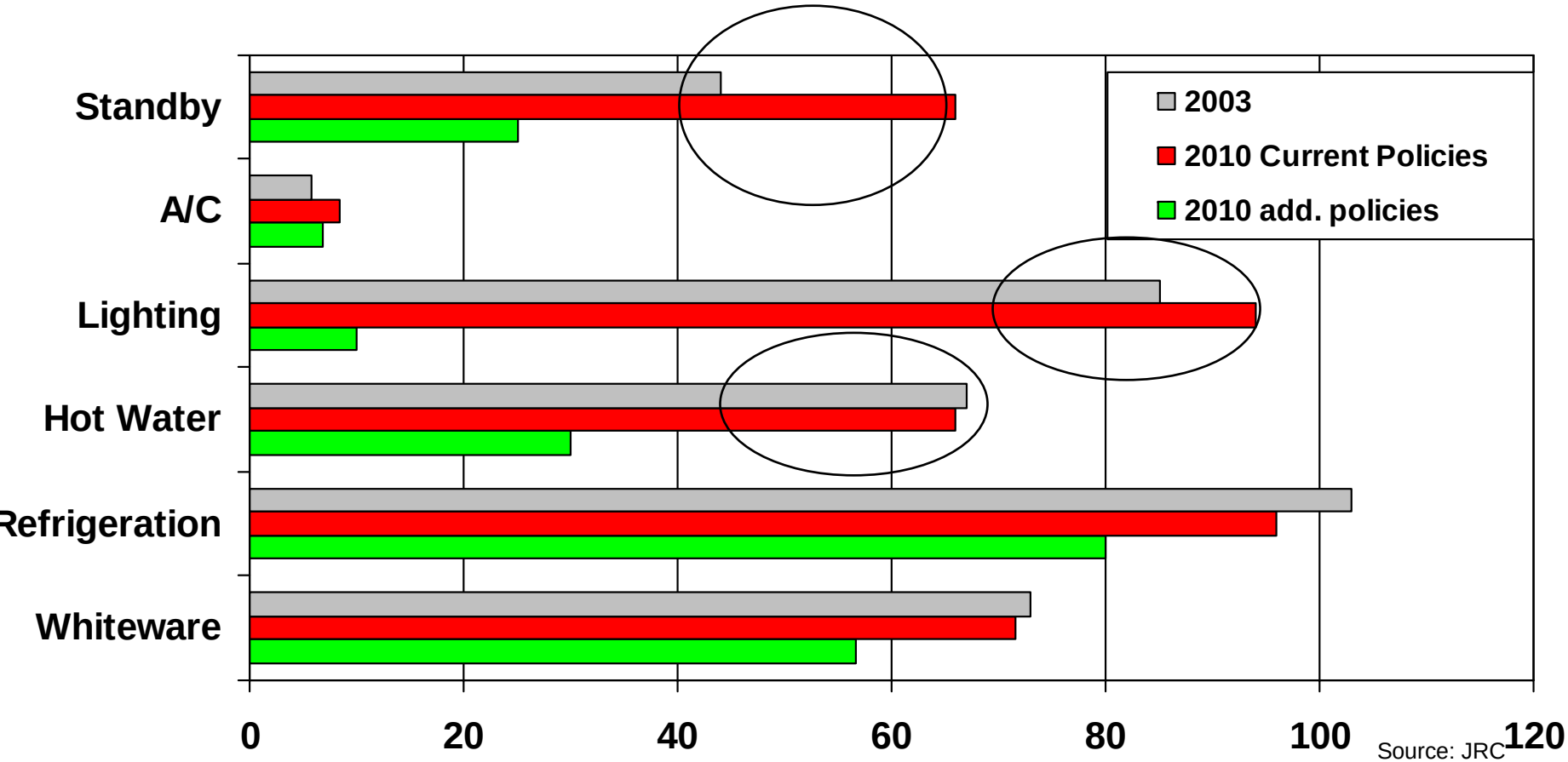
- Solutions for curbing increasing standby consumption?
- What are the perceived future trends for lighting?
- How to influence behaviour – is this the right track? What can be achieved?
- What are the methodological limitations, and what can be done to overcome these? Bottom-up models vs Top-down?
- What are the expectations and priorities for policy making? What should researchers aim for, taking into account resource limitations?

SUPPLEMENTARY slides

Standby (4)



Background (2)

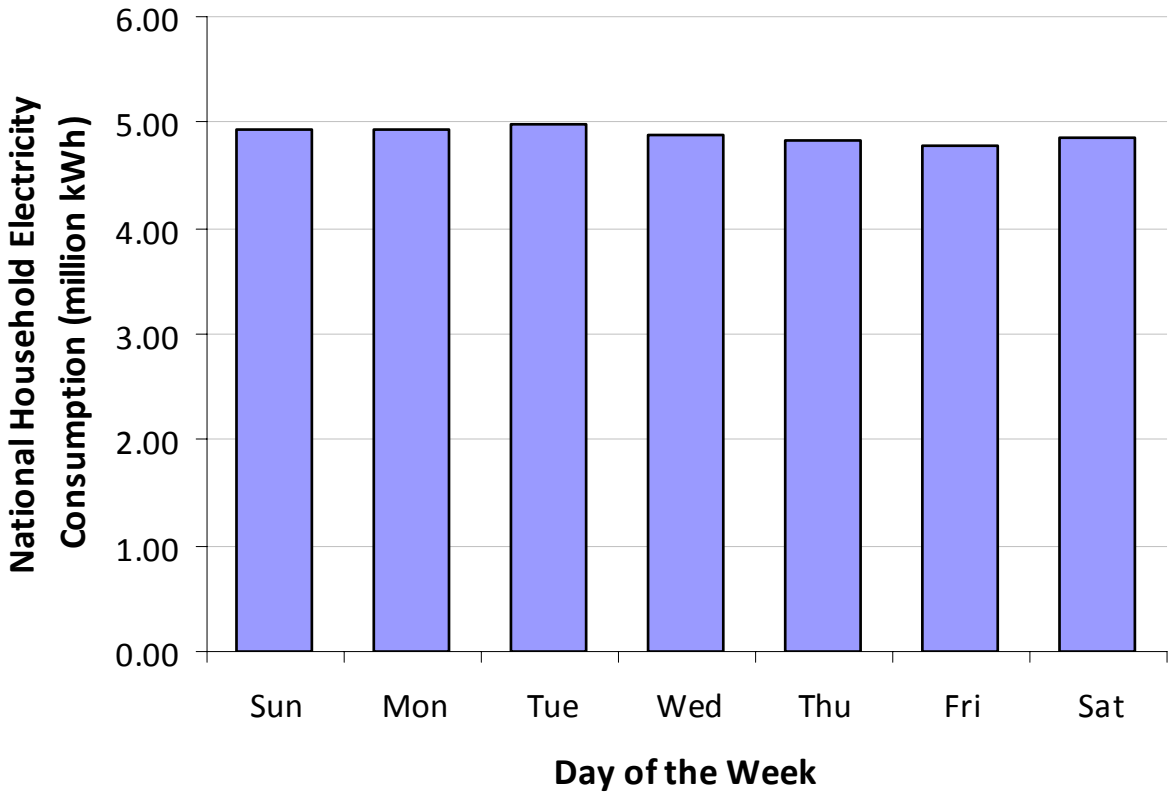


Domestic Annual Consumption EU25 [TWh]
(~10% of total)

Cold appliances – national electricity consumption

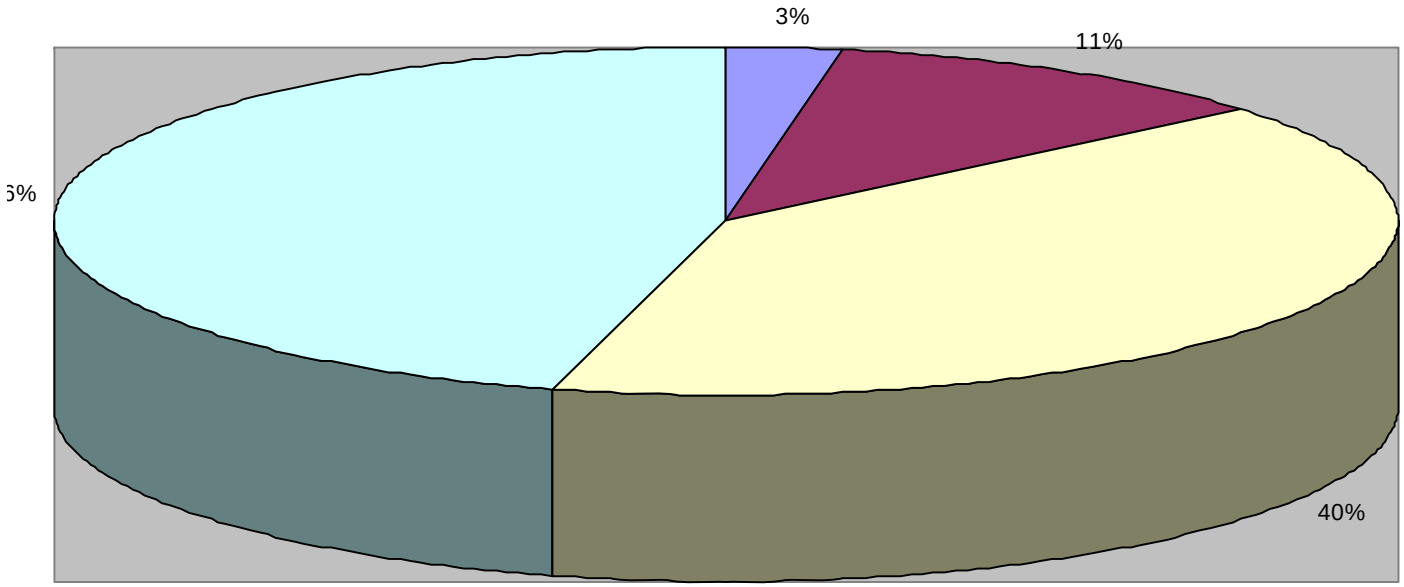
Total National Consumption:

2.69 TWh/yr



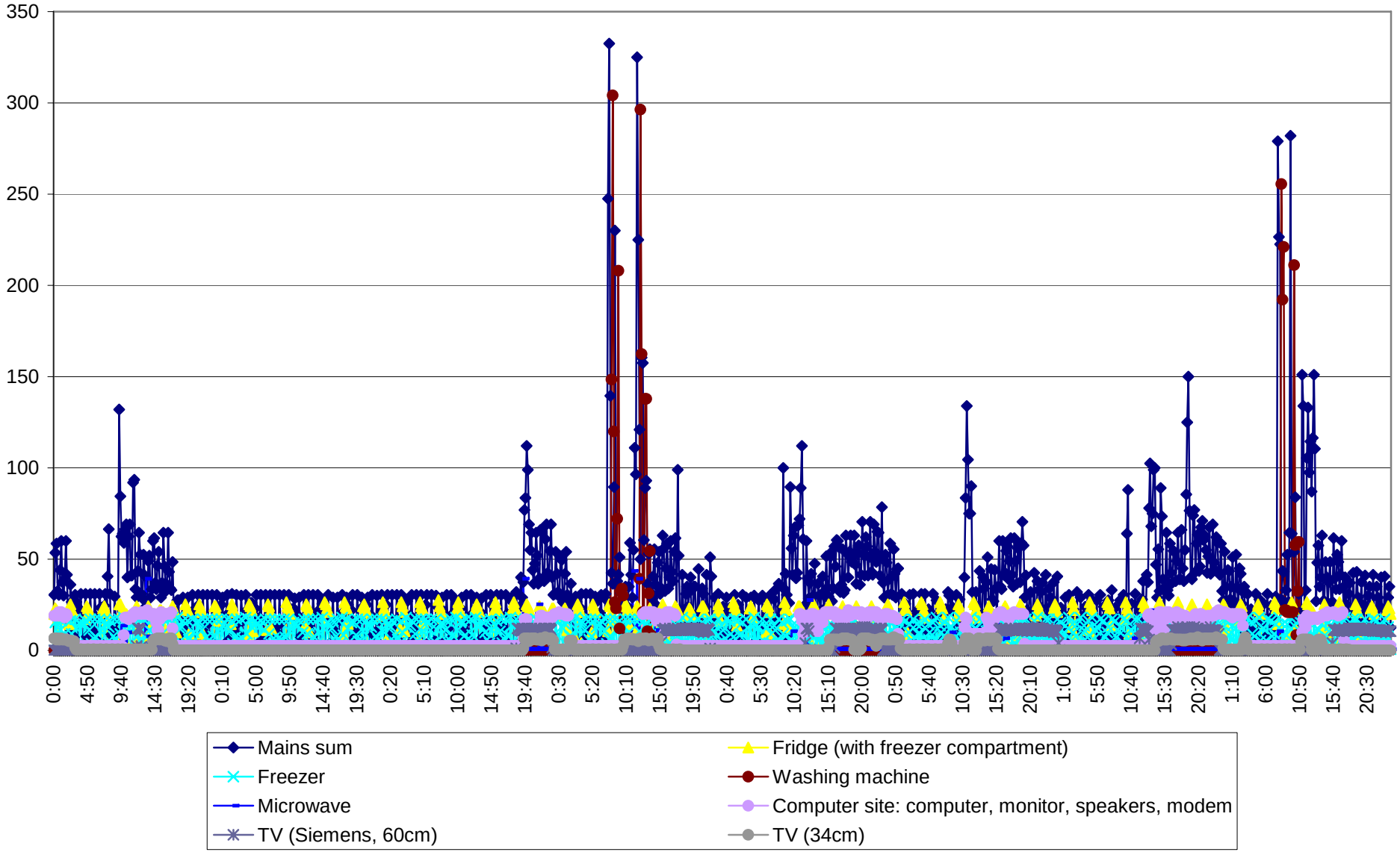
Standby (5)

Why are computers left on?



BG19

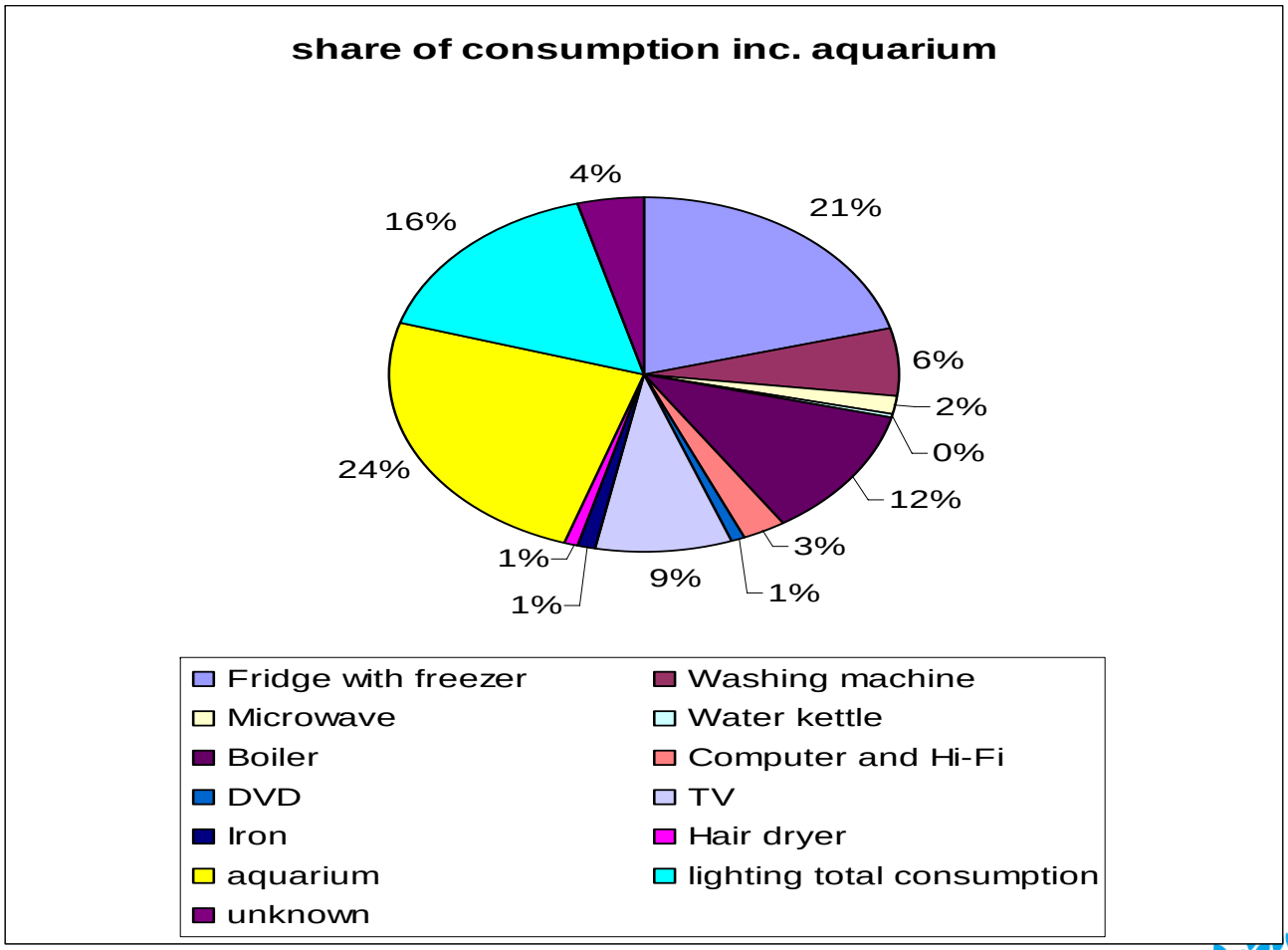
Electricity load in households



BG19 is this relevant and to start with?

Boza Gergely; 18.04.2008

Relative electricity consumption of appliances in households – 2 examples



HH15, total consumption: ca. 210 kWh/m