

Energy Analysis of the FutureLife-House

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Overview

1. Starting point
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6. Conclusions

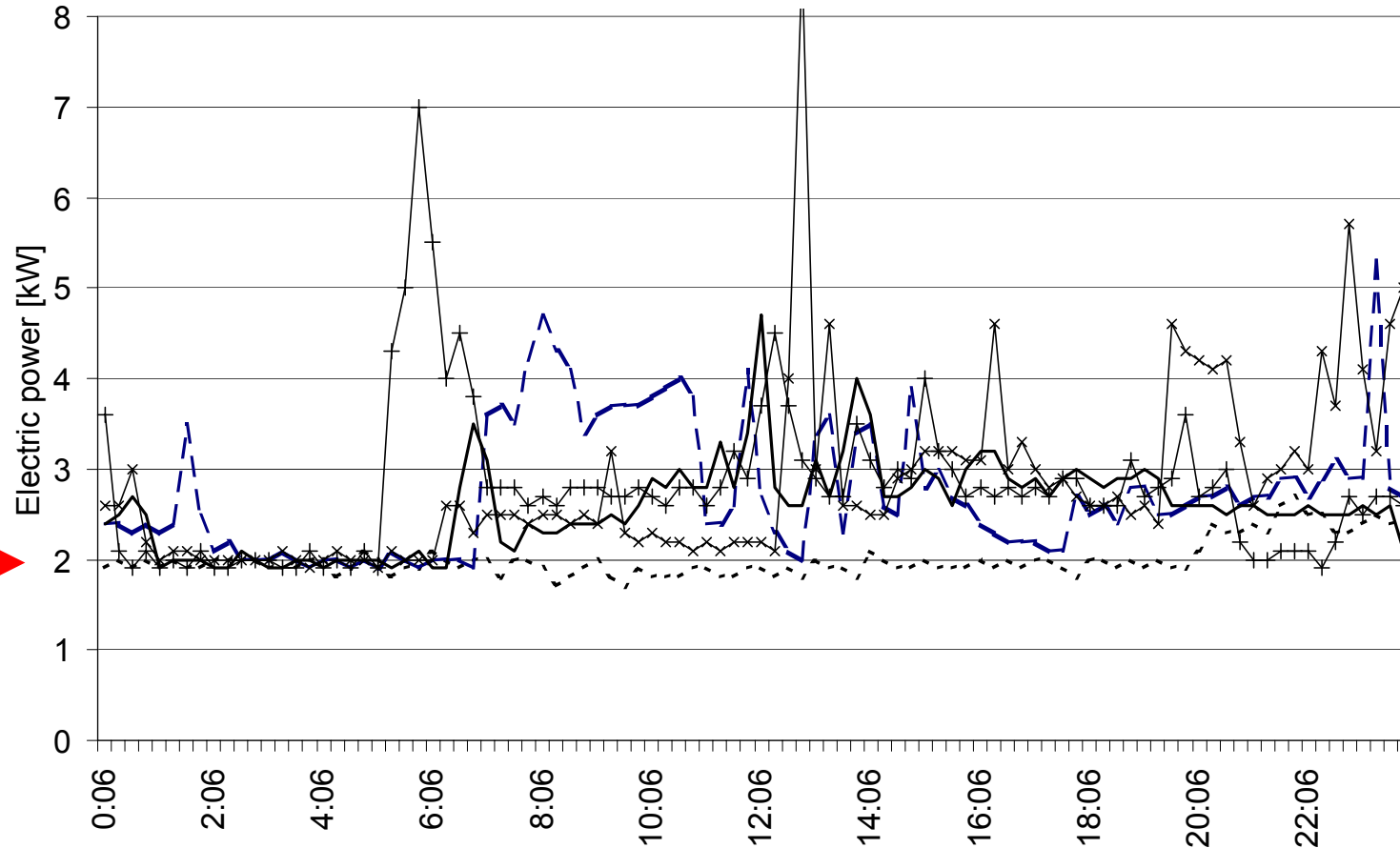
Starting point

- Impact on electricity demand of networking in private households: simulation and scenario calculations (Aebischer and Huser, 2000)
- Upper limit = +30% electricity consumption in the Swiss residential sector within the next 20 years.
- Substantial increase in standby losses (Bertoldi et al., 2002)
- Hardly any empirical data

This study: objectives and approach

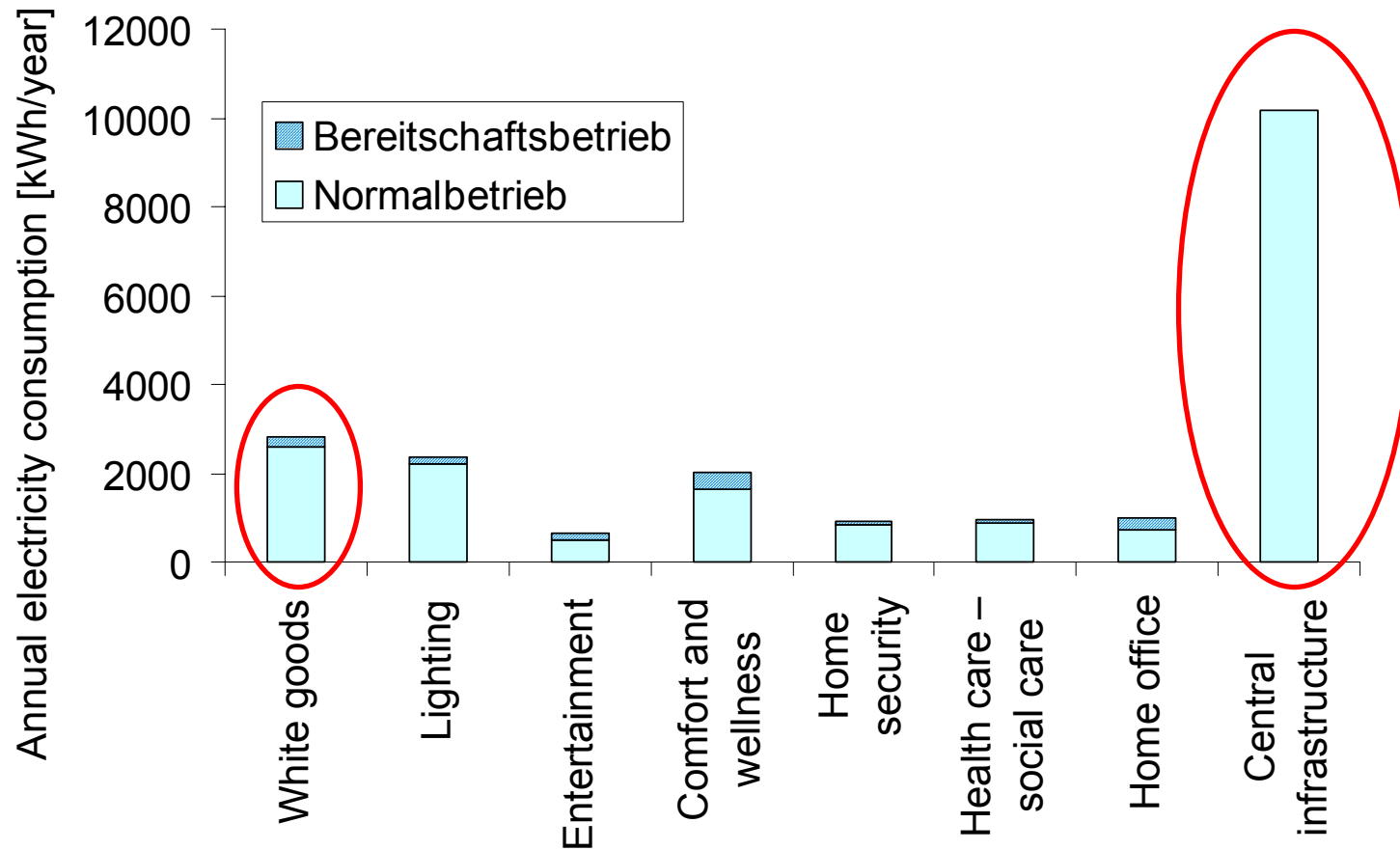
- Objectives
 - Measure and analyse electricity use in a fully automated house (www.futureLife.ch)
 - Increase significance of simulations (not diffusion = scenario calculations!)
- Approach
 - Analyse electricity bills
 - Measurements of power load and electricity consumption
 - Estimation of usage pattern
 - Data bank with characteristics of 100 equipment

Results: electricity consumption (1)



Total power load (15 minutes intervals) on 5 weekdays, in kW

Results: electricity consumption (2)



Electricity consumption per functional groups of equipment

Definitions (1)

- **Normalbetrieb:**
the equipment fulfils (one of) its main function(s),
there is only one operating mode,
other operating modes are disabled.
- **Bereitschaftsbetrieb:**
the equipment is in a mode other than in the one
fulfilling its main function(s).
- **Standby power** is the electricity consumed by end-use
electrical equipment when it is switched off or not
performing its main function (Bertoldi, P. et. al., 2002)

Definitions (2)

Comfort, wellness, climate:

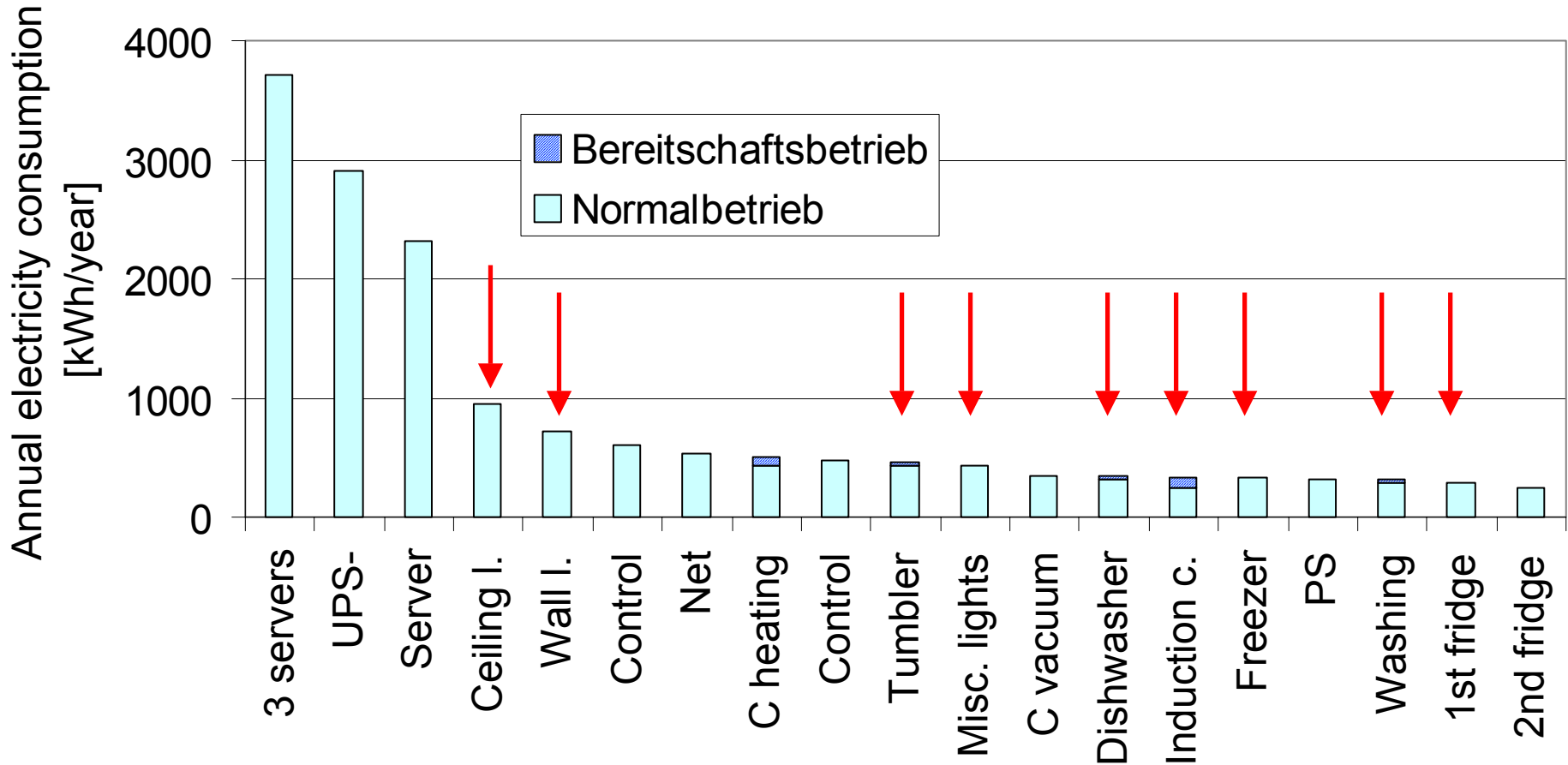
- 49 Datapoints EIB
- Control cabinet gas-heating-system
- Power supply Wave Lan
- WAVE LAN single antenna
- Control cabinet UNIGYR
- Windows opener (10x)
- Awnings (10x)
- Curtains (13x)
- Photovoltaics-system
- Irrigation system

Definitions (3)

Health care, social care:

- Centralised vacuum cleaner
- Bathtub
- Shower-WC
- Ionisation system
- Massage chair
- Shower (valve) Guests WC
- Shower (valve)
- Water Dispenser
- Fitness-equipment
- 2 electronic valve watertap (battery supply)

Results: electricity consumption (3)



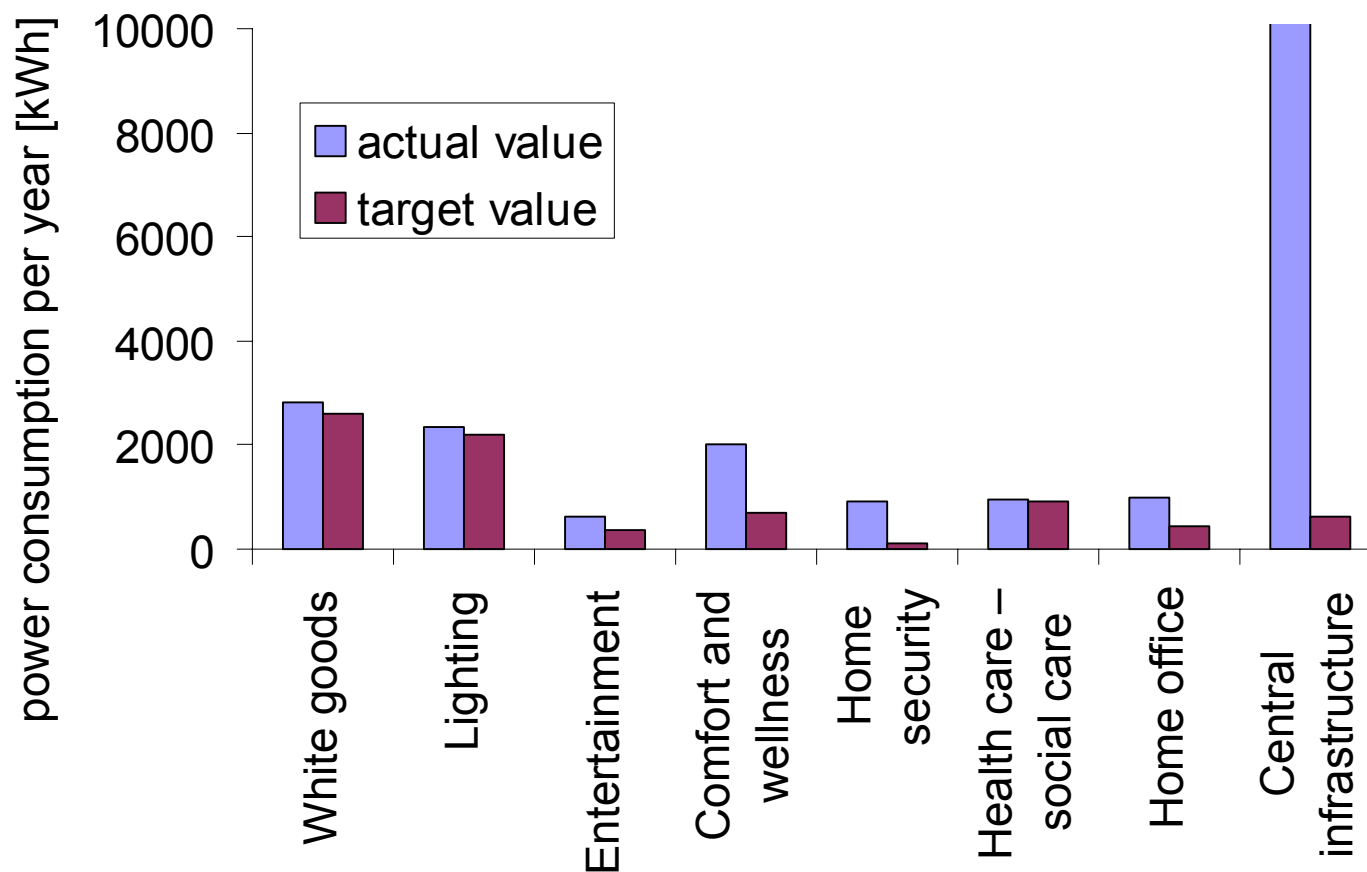
Annual electricity consumption of the 20 largest electricity consuming equipment

Results: saving potentials (1)

Measures considered:

- automatic power management of all electronic equipment
- low power mode of 1 Watt for all electronic equipment
- use of a single central gateway
- renouncement to use a UPS
- replacement of halogen lamps by fluorescent lamps

Results: saving potentials (2)



Measured and achievable el. consumption per functional groups of equipment

Results: comparison with electricity consumption in an ordinary house in Switzerland

	FutureLife-House today	Typical house Switzerland	FutureLife-House optimised
Servers and UPS	100		5
Equipment for and due to networking	100		25
New applications	25		25
Standard equipment	100	100	100
Total	325	100	155

Definitions (4)

- **New equipment and new uses of electricity** (steamer, plasma TV, mechanical aeration, mechanically moved curtains, shower-toilet, ionisation column, massage-chair, water dispenser, fitness equipment, central vacuum cleaner)
- **Equipment needed for networking and installed in order to use the facilities of networking** (refrigerator sky-box, sound system, beamer, PC and monitor in home office, TV Internet gateway, home infotainment, web cams, door opener, alarm equipment, fingerprint sensors, etc.)

Conclusions

- Measured power load of 100 equipment
- Substantial increase of electricity demand by home automation
- White goods less important than expected
- Standby:
 - Top-down today: 2 kW? (24x7 = commercial building)
 - Bottom-up: not measured
- Not considered:
 - Central infrastructure outside the house
 - Impact on energy demand outside the house