

IEA ECBCS Technical Day, 14 November 2012, Bern, Switzerland, «Bridging the Gap between Policy and Science»

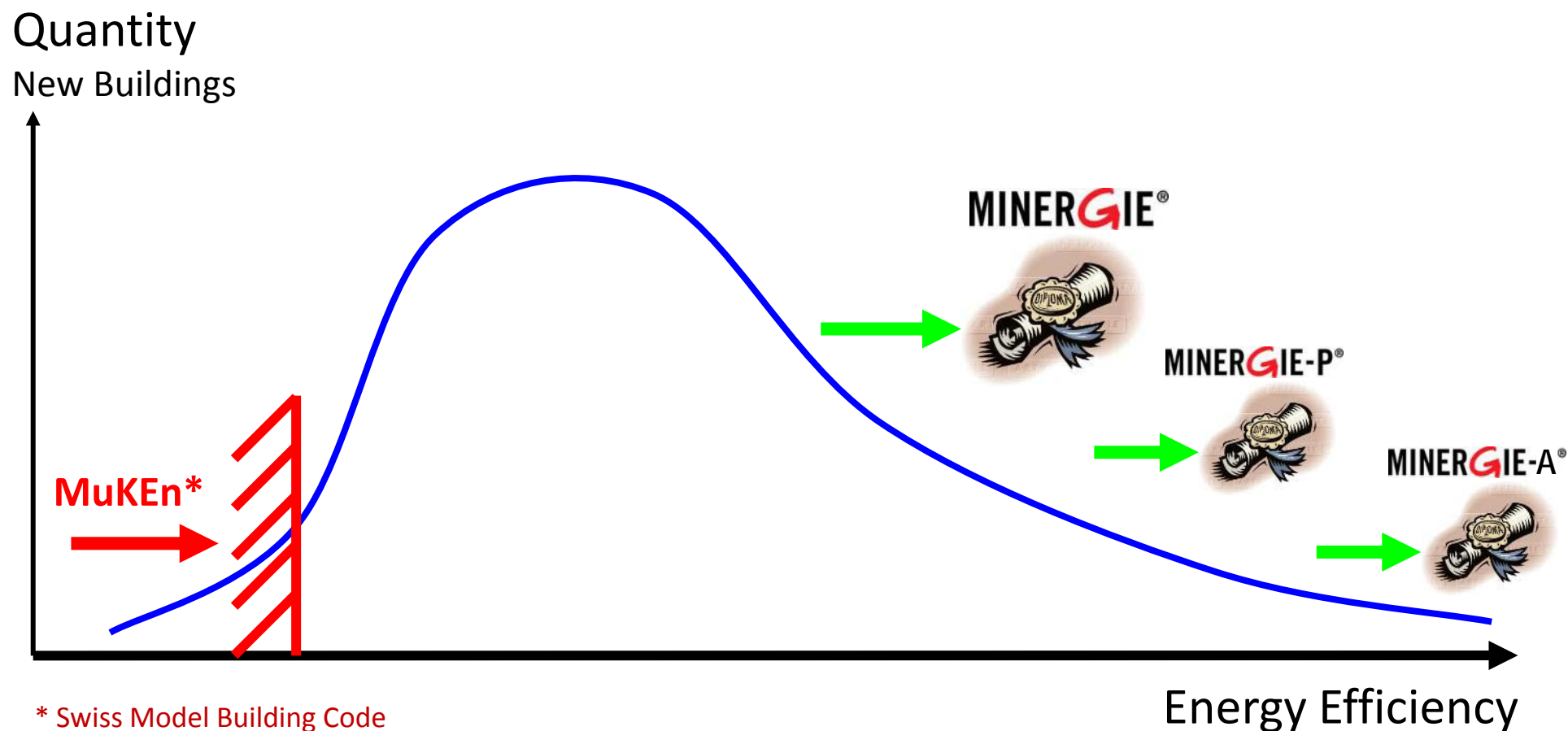
# MINERGIE-A - the Swiss Net Zero Energy Standard

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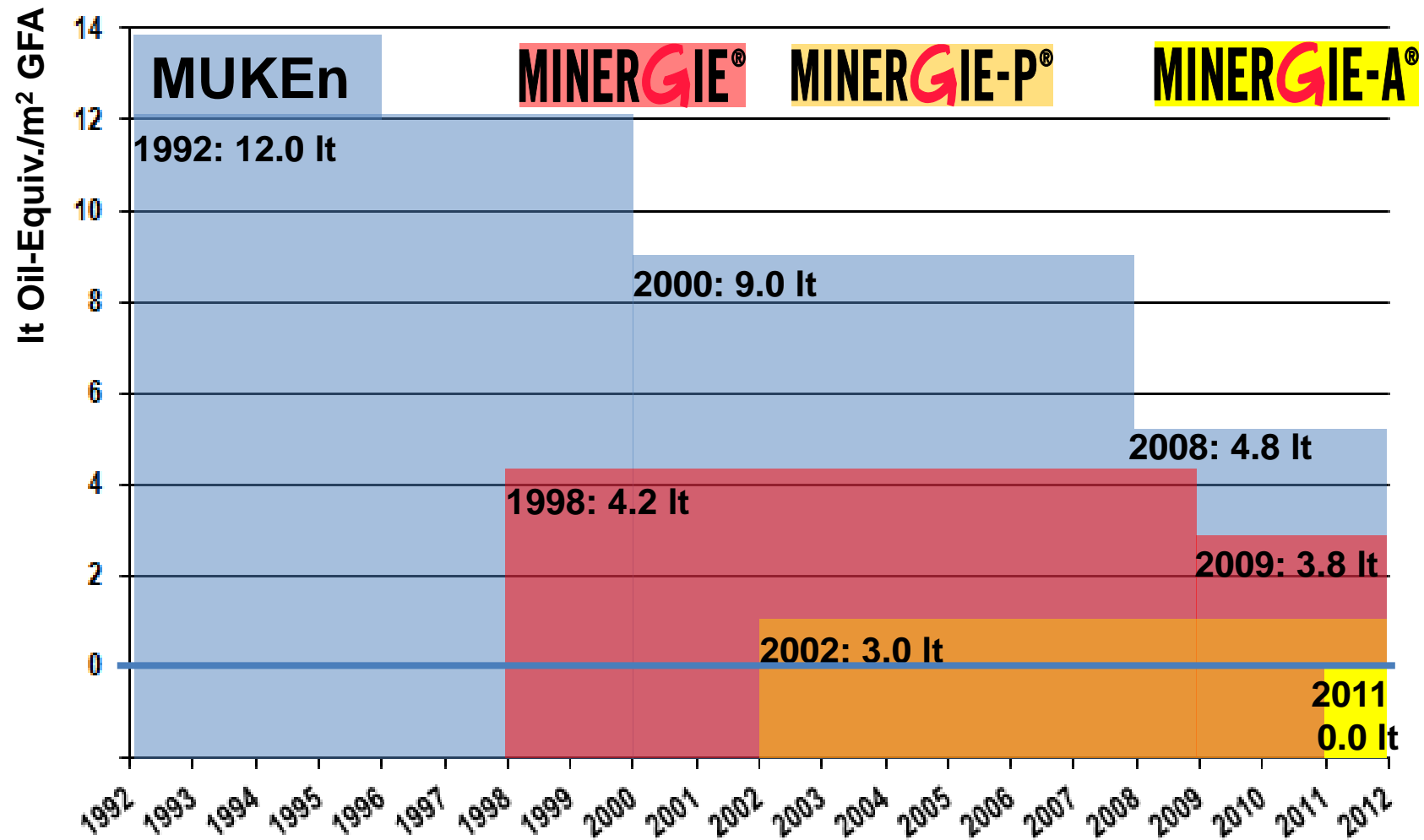


# MINERGIE – The Pull-Element in Energy Policy in the Building Sector



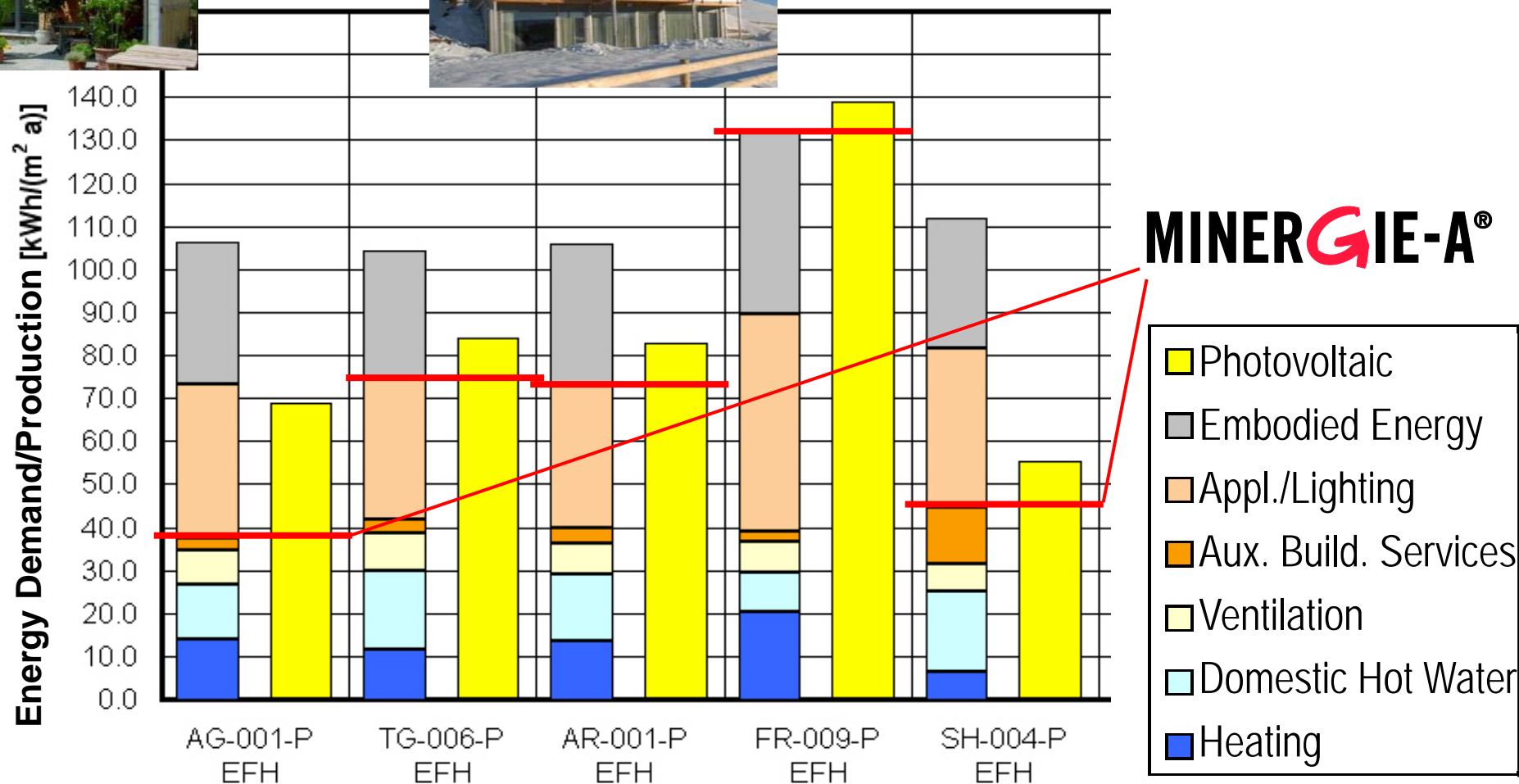
# MINERGIE – The Forerunner of the Building Code

Specific energy demand for heating and domestic hot water in weighted energy for new buildings in the last 20 years





## Weighted Energy Demand versus PV-Electricity Generation



# Terms and Definitions

Heating,  
cooling

Hot water

Ventilation

Pumps,  
valves etc.

Appliances,  
lighting, ICT

Embodied energy

Mobility

Zero **Heating** Energy Buildg



Zero **Heat** Energy Buildg



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**MINERGIE-A®**

Zero **Energy** Energy Buildg



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Zero **LCE** Energy Buildg



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Zero **EnMo** Energy Buildg



+



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Zero **2000-Watt** Energy Buildg



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# BE-001-A-ECO

## First official MINERGIE-A-ECO-House

Single family house, Sagiweg 12, Rosshäusern

Building owner: I. Kempf + A. Kormann, Rosshäusern

Architect: AAB Architekten, Bern



Wood pellet heating + solar thermal  
(30% total heat demand)

Photovoltaic: 4.2 kWp

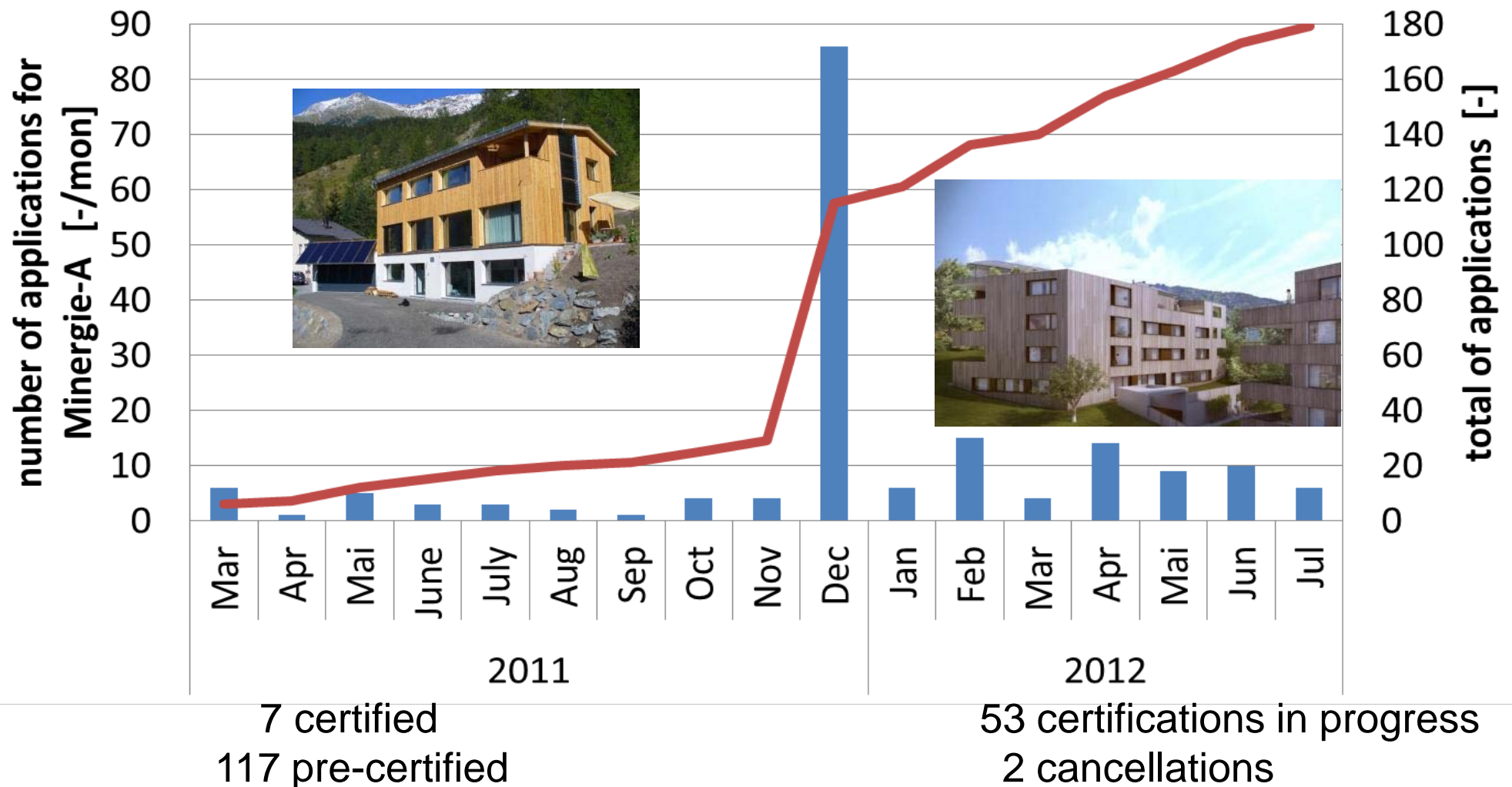
Energy balance: -3.1 kWh/(m<sup>2</sup>\*a)

Embodied energy: 46.2 kWh/(m<sup>2</sup>\*a)



# Minergie-A

One and a half year of rapid growth



# One and a Half Year of Experiences with MINERGIE-A



MINERGIE-A  
certificate is building  
related

Questions:

PV-generation  
«on building footprint» or  
«on site»?

PV for developments with  
only MINERGIE-A buildings:  
PV-Panels concentrated on  
half of the buildings? May  
single family houses help  
out multiresidential houses?





# Thermal solar installation aside not on the building



**SZ-001-A**

## **Building Owners**

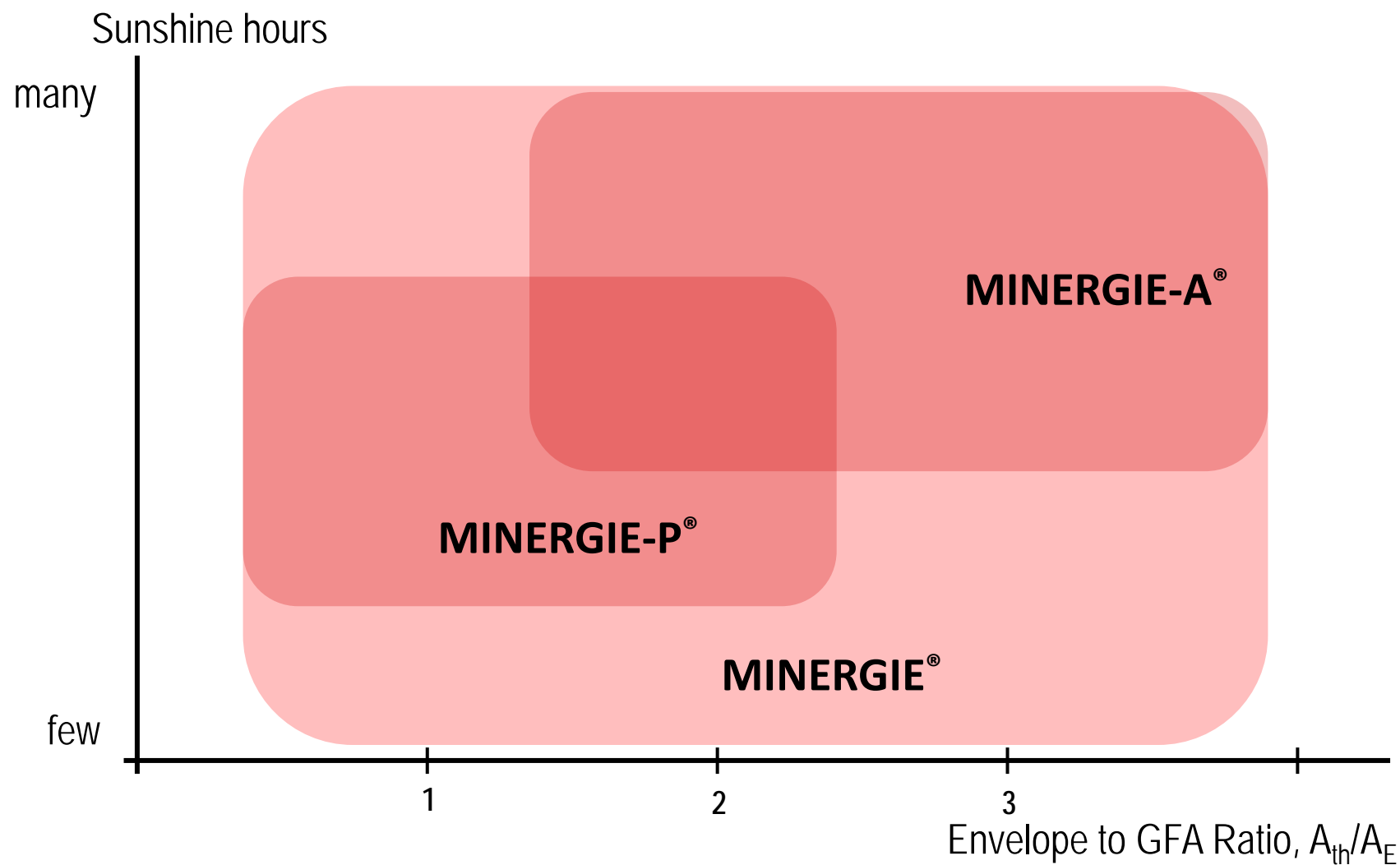
Christin und Otmar  
Spescha  
Untere Mangelegg 4  
6431 Schwyz

## **Planner**

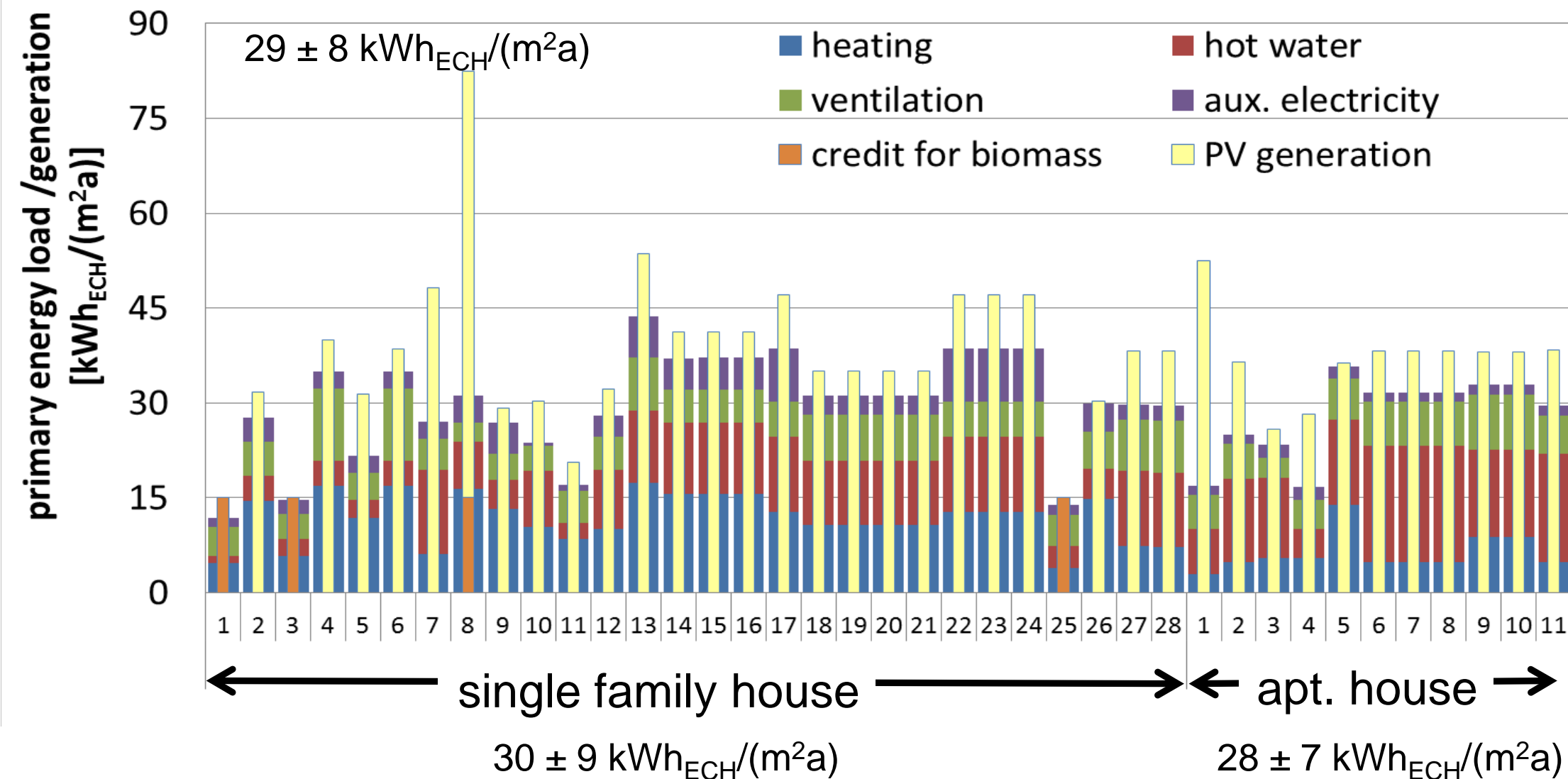
**FACHPARTNER**

Otmar Spescha, Engineering  
firm for energy efficient  
building  
Untere Mangelegg 3  
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# The Specific Aptitude of the Different MINERGIE Standards



# Minergie-A: net zero heat (heating and domestic hot water) balance



# MINERGIE Building Standards – Main Requirements Overview

	MINERGIE		MINERGIE-P		MINERGIE-A Only Residential	
	New Building	Retrofit	New Building	Retrofit	New Building	Retrofit
Heating	38	60	30	30	0/15	kWh/(m <sup>2</sup> a)
Domestic Hot Water						
Cooling						
Electricity (Lighting, Appliances)			Best available technology			
Embodied Energy					50	kWh/(m <sup>2</sup> a)
Local Production					Compensation of space conditioning and hot water	

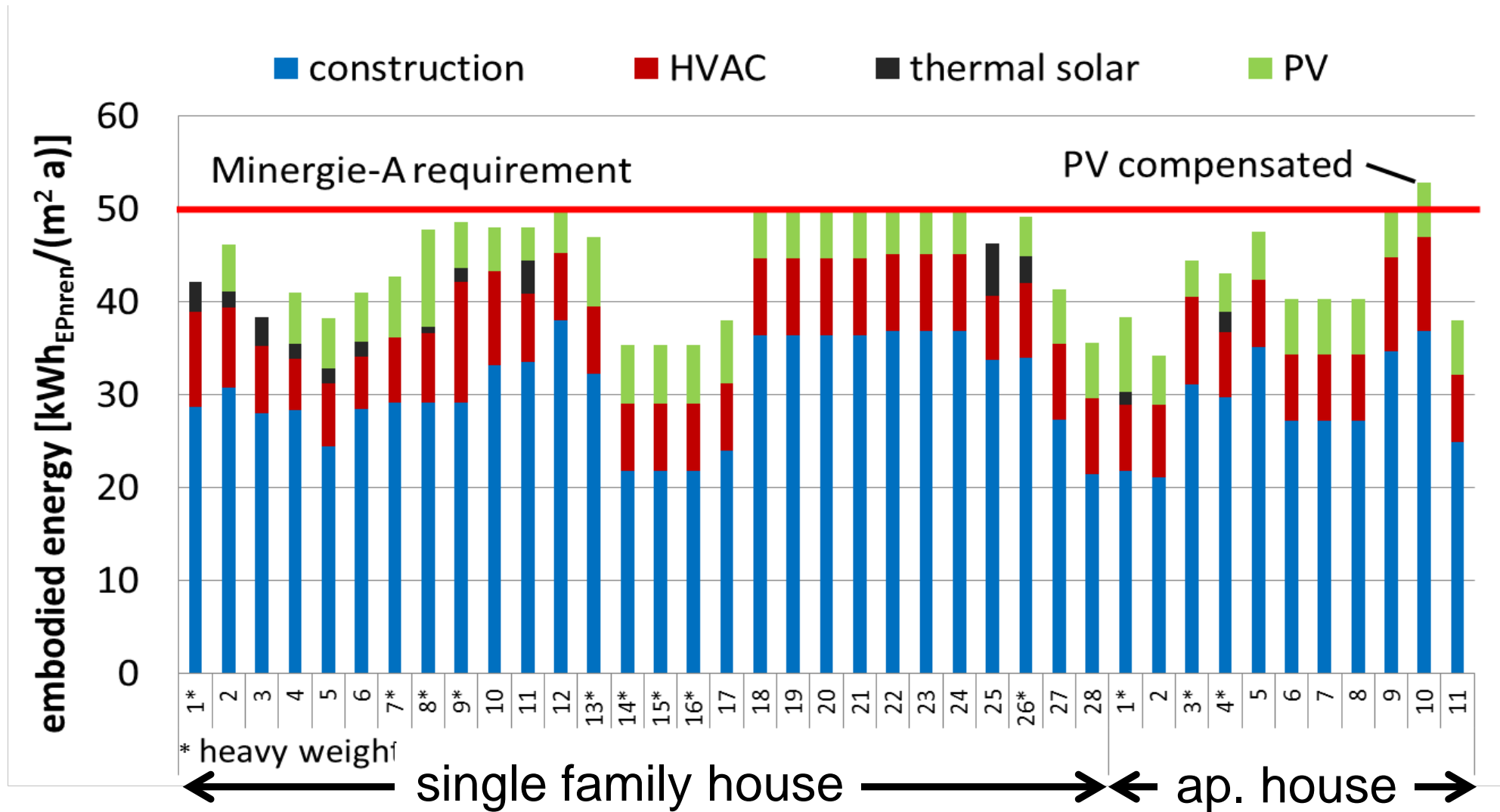
Implementation of standard: 1998

2003

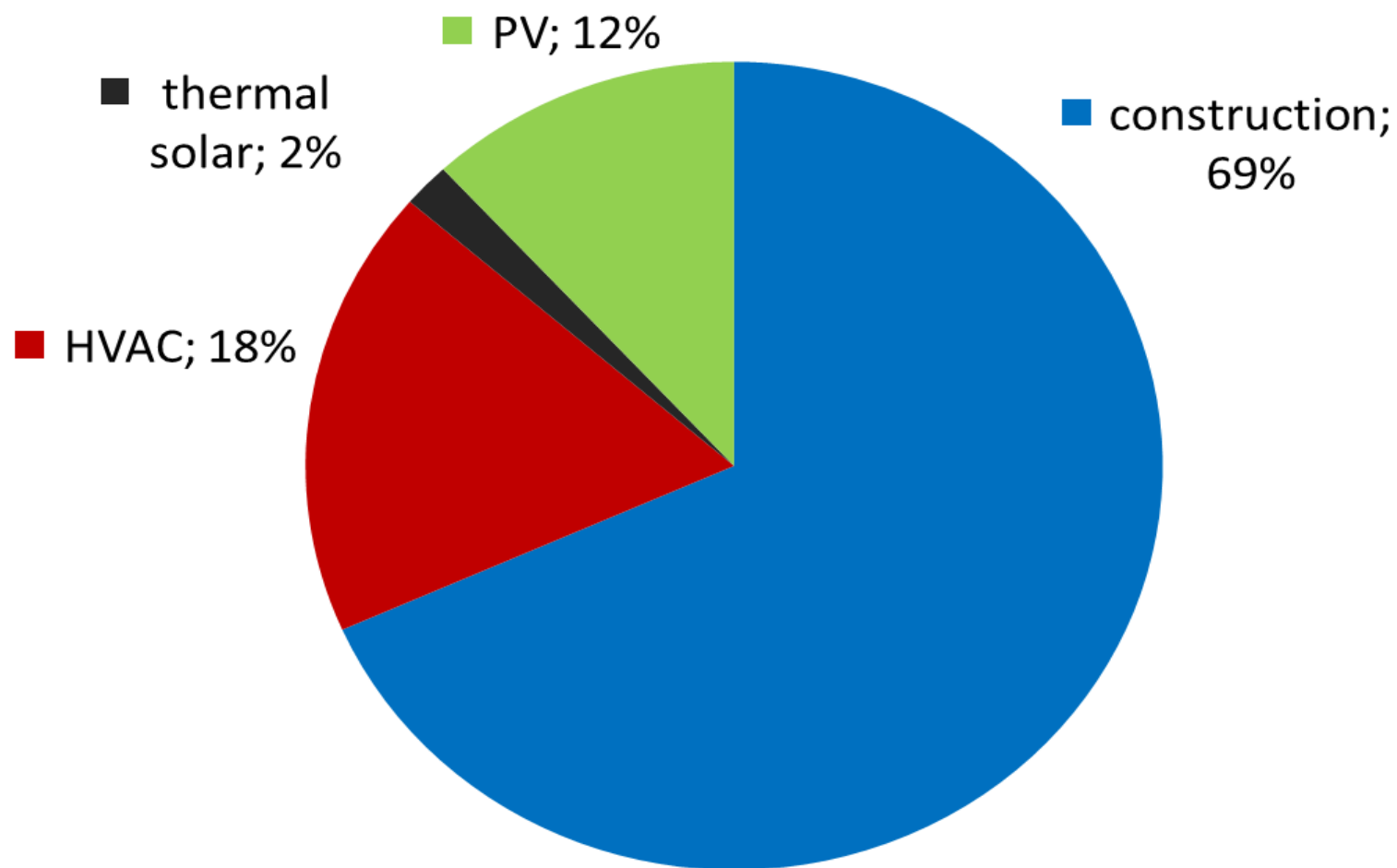
2011



# MINERGIE-A: Embodied Energy

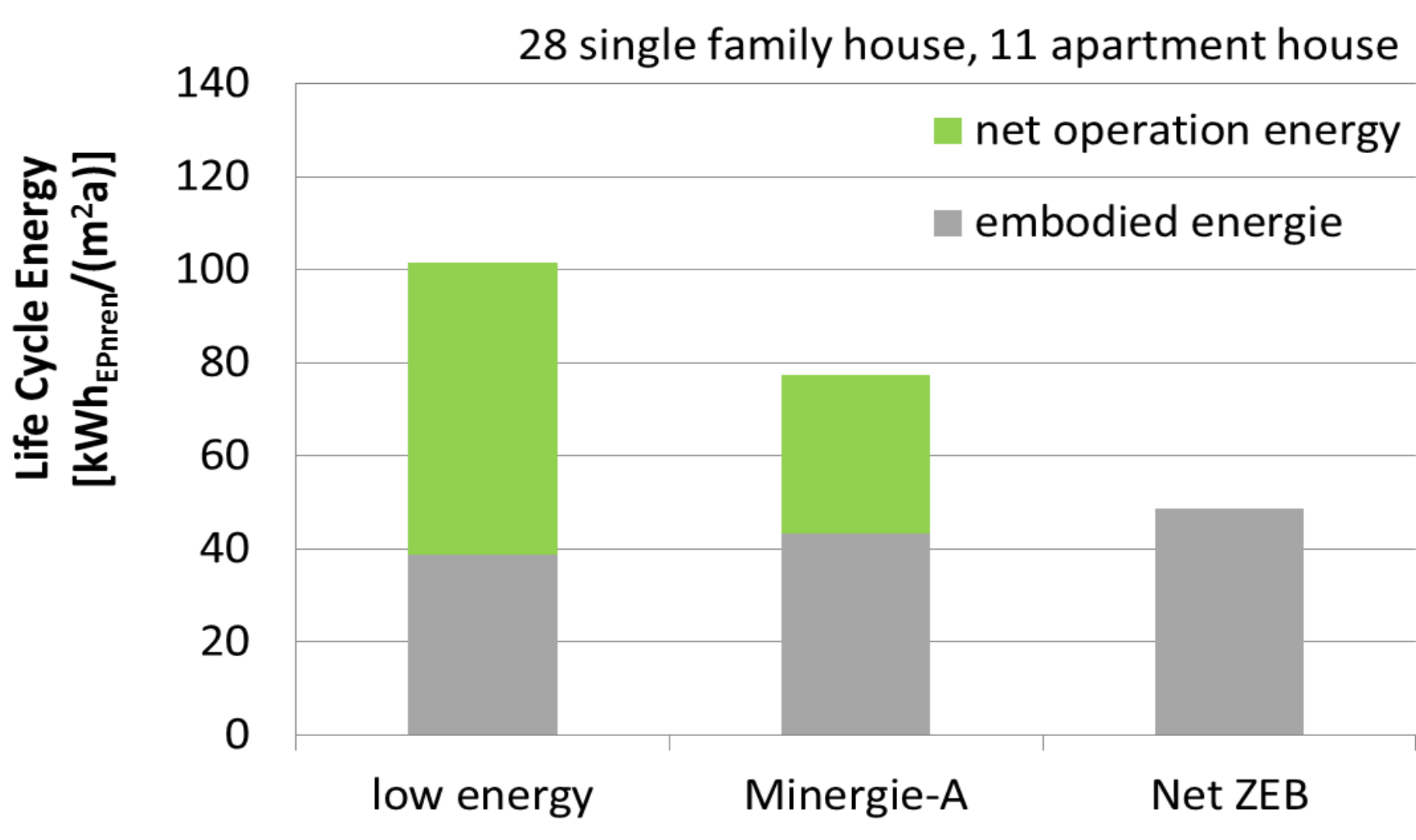


# MINERGIE-A: Embodied Energy

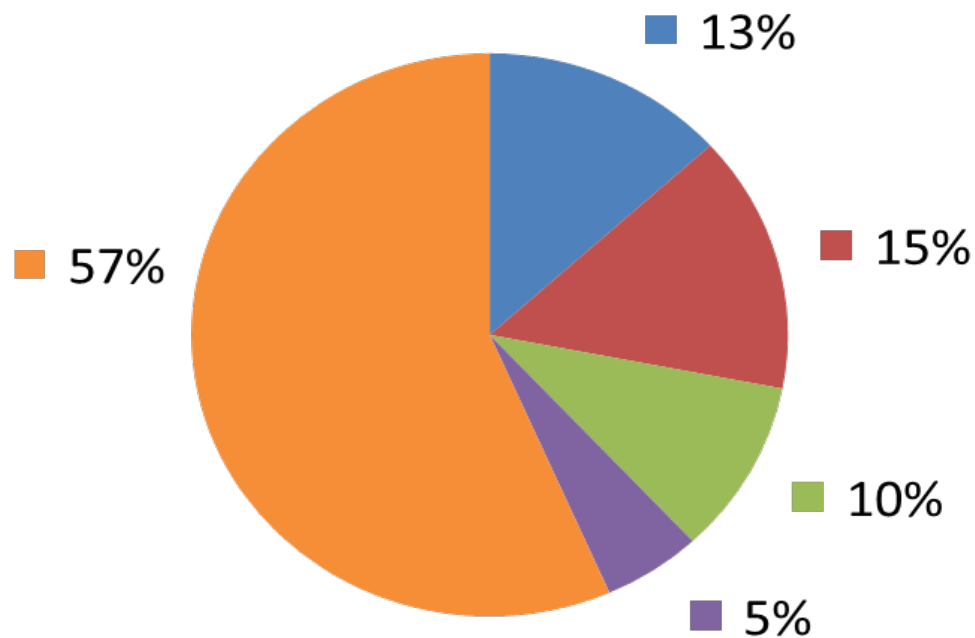


average:  $44 \pm 5 \text{ kWh}_{\text{EPnren}}/(\text{m}^2\text{a})$

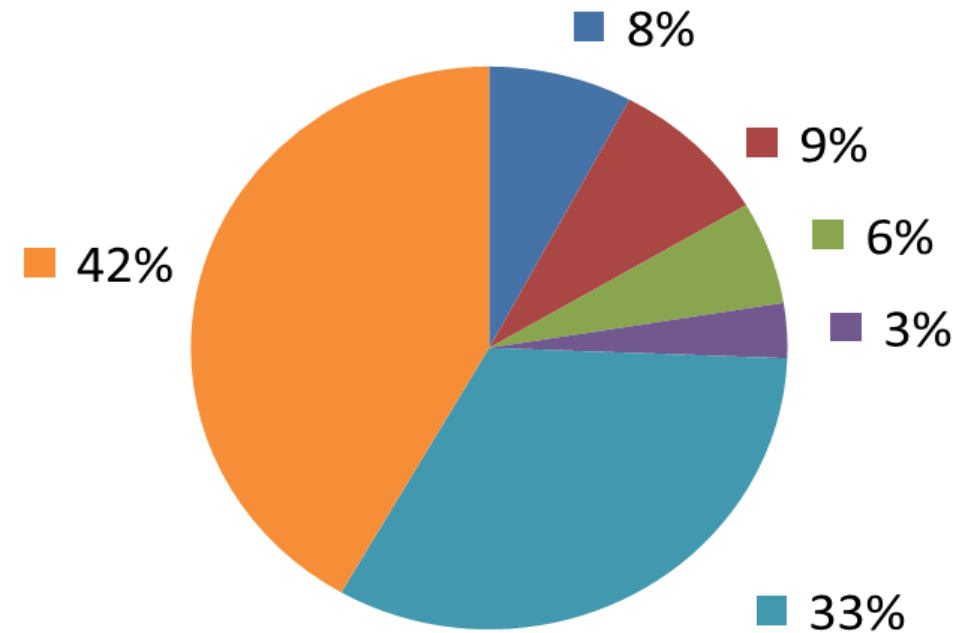
## Life cycle energy of different building standards



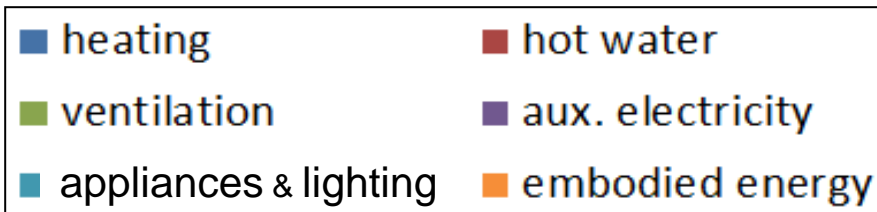
# Operational and Embodied Energy Shares of Total Energy



Minergie-A:  
without appliances/lighting:  
 $77 \text{ kWh}_{\text{EPnren}}/(\text{m}^2\text{a})$

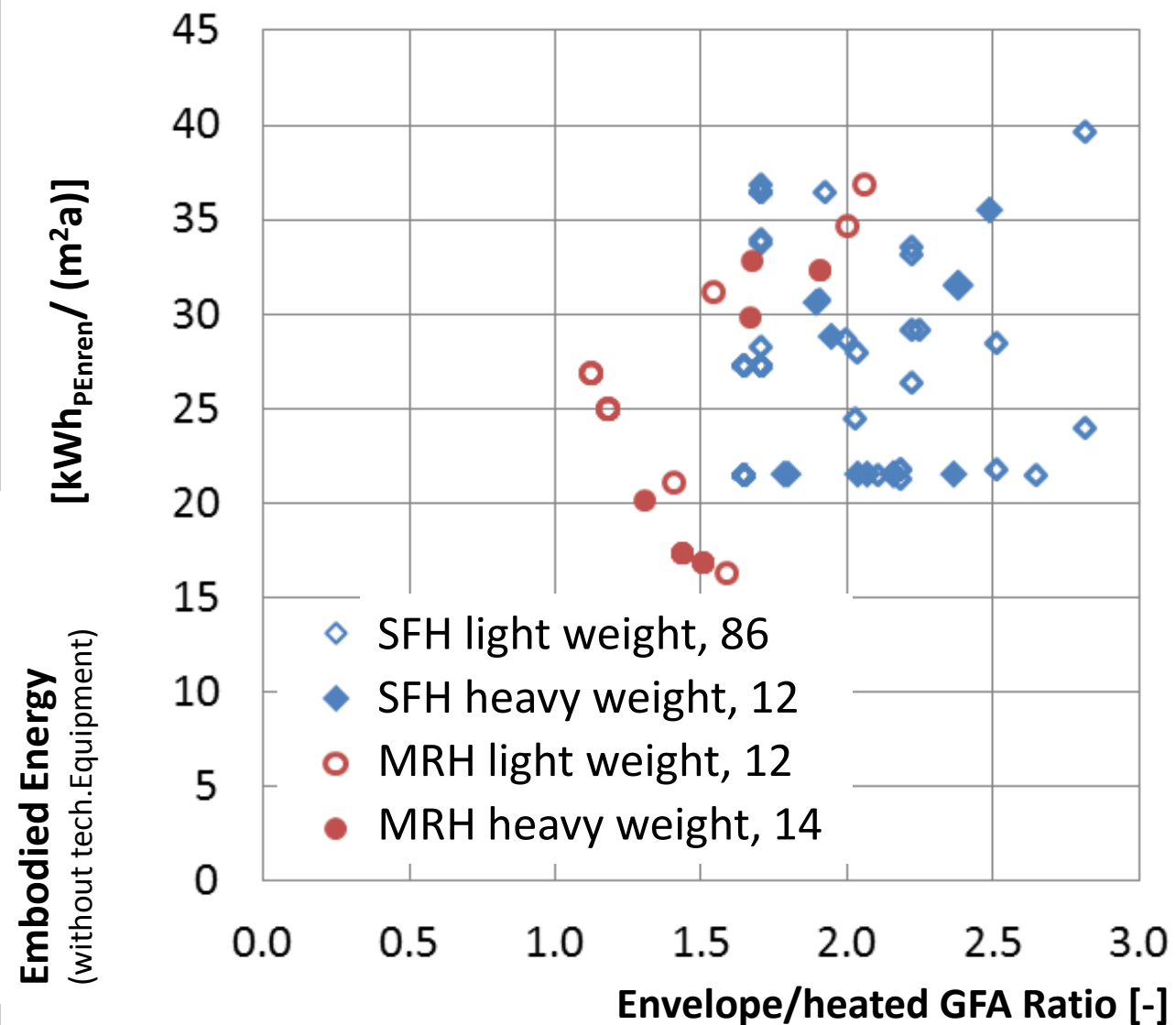


Net ZEB:  
appliances/lighting included:  
 $131 \text{ kWh}_{\text{EPnren}}/(\text{m}^2\text{a})$



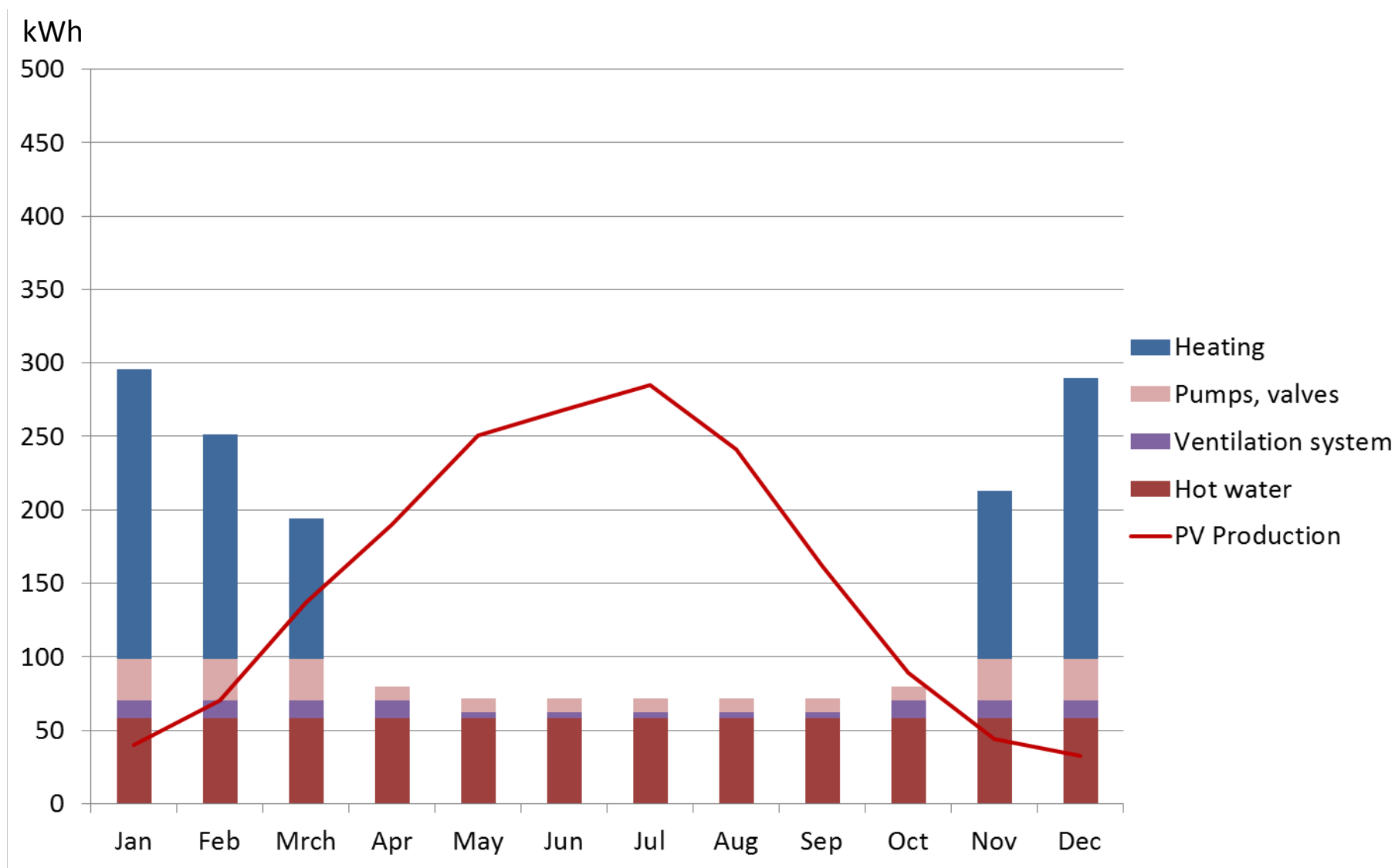


# MINERGIE-A - Embodied Energy vs. Compactness and Construction Type

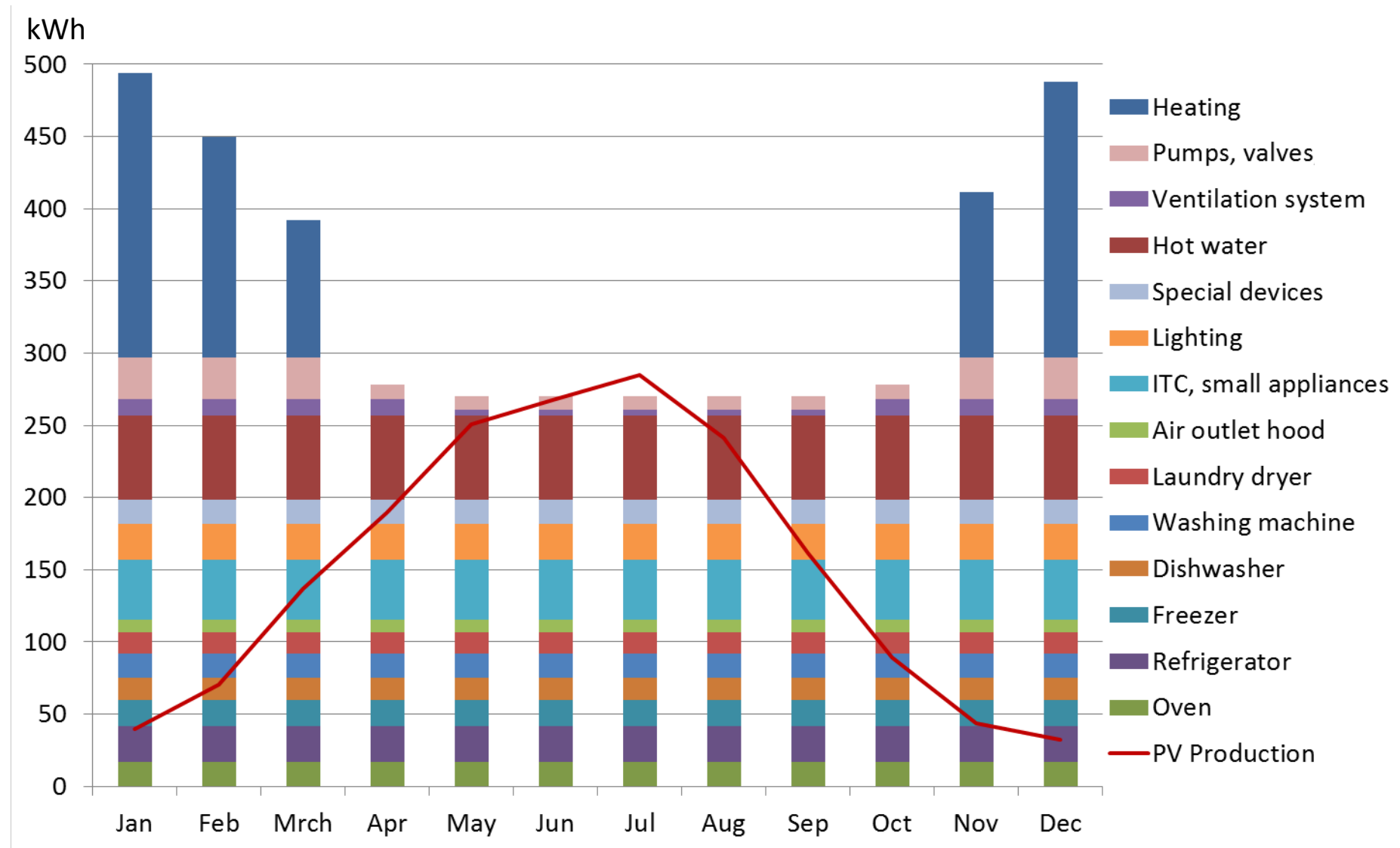


# MINERGIE-A, Demand and Production Load Match

Single family house, 200 m<sup>2</sup> heated GFA, ground-coupled heat pump, 20 m<sup>2</sup> PV, Swiss Midlands



## ...Taking into Account Demand for Appliances and Lighting



# Monitoring of an All-electric Building with Everything Included

Zero-2000-Watt-Building



- Multiresidential building  
3 Apartments (rented)
- Heated GFA = 396 m<sup>2</sup>
- Ground-coupled heat pump,  
Ventilationsystem with heat recovery
- 20 kWp PV (Orientation south, 10°)
- Renault Fluence Z.E. (Range 160 km)
- Occupied since September 2011
- Measurements: Okt. 2011 – Sep. 2012



AG-005-P-ECO



Setz Architects

**FACHPARTNER**

Werner Setz

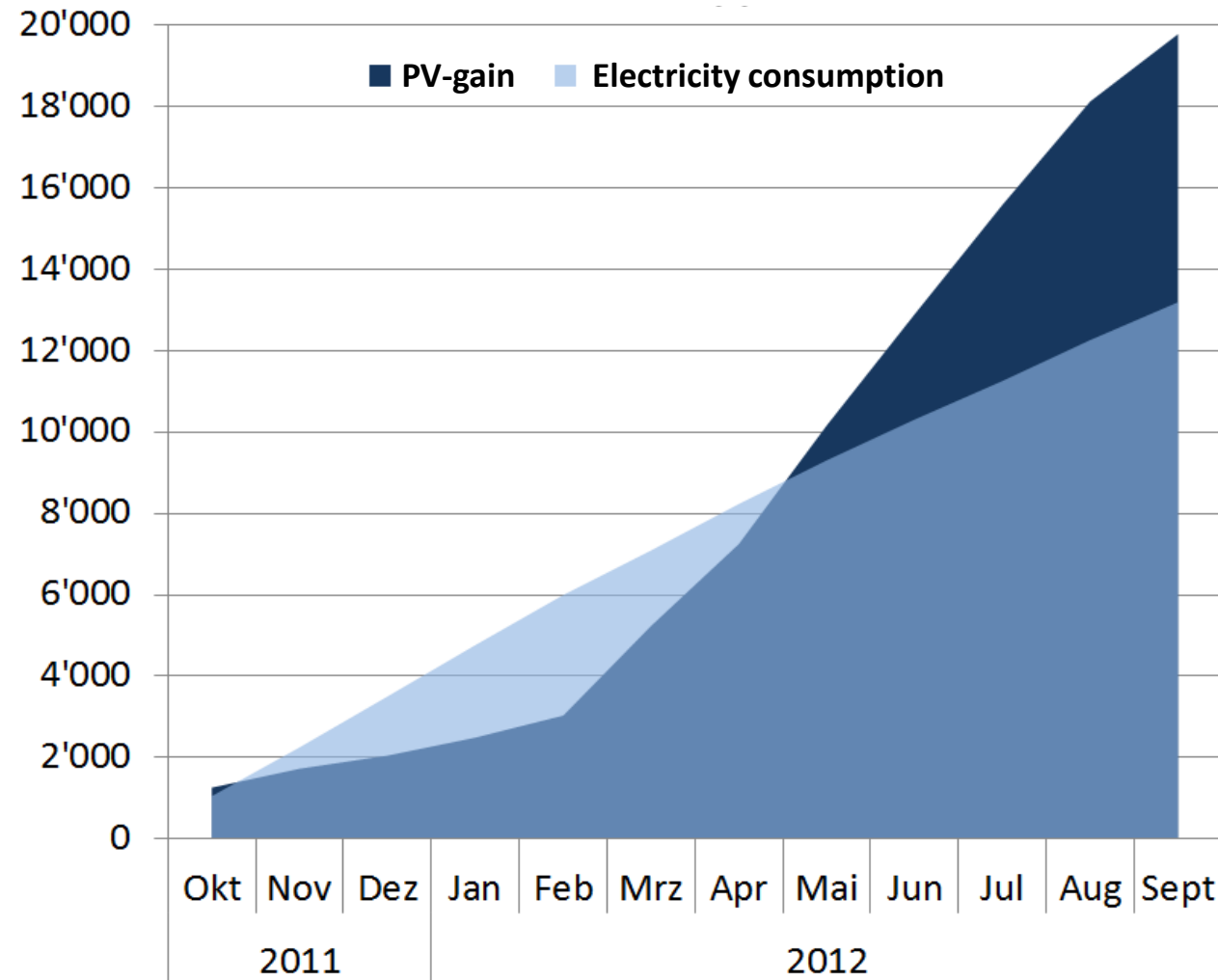
Obermatt 33, Rapperswil



# Surplus Solar Gain and Yearly Load Mismatch

MRH in Rapperswil, electric car included

Cumulated PV-gain and electricity consumption [kWh]

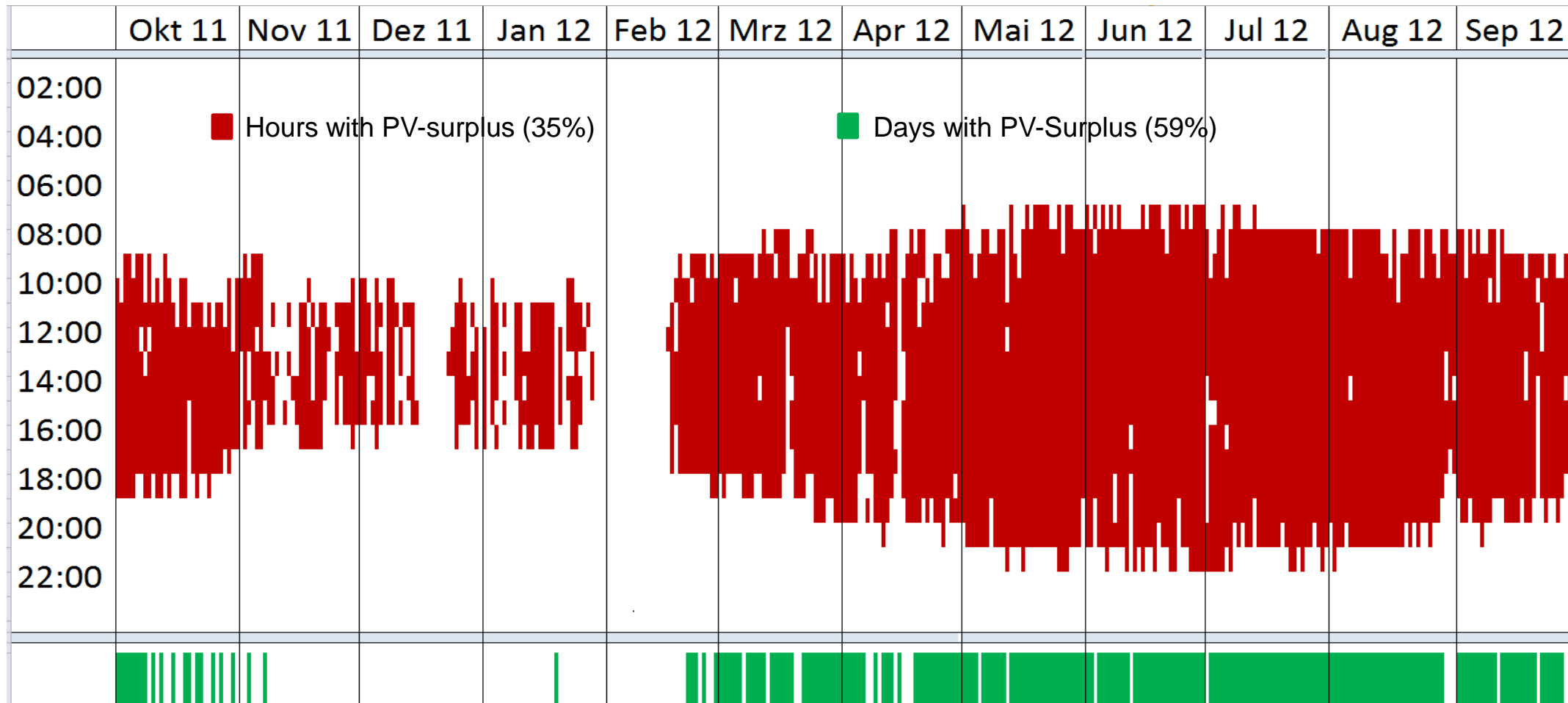


## Results:


- Energy consumption slightly higher than (calculated) demand
- PV-production about 50% higher than consumption (electric car included)
- Energy consumption within apartments about 50% of total consumption, about 70% of it being delivered by the utility
- Heat pump is the largest single user

# Grid Interaction and Load Match

MRH in Rapperswil, PV-production 20 kWp (Swiss Midlands, orientation south, tilted 10°)



→ 32 % (4'165 kWh) electricity delivered by utility on PV surplus days

A black, box-like structure with a slanted roof, mounted on a mechanical frame with four legs. Each leg has a yellow circular foot. The structure is positioned on a paved street in front of a stone building with arched windows. A red flag is visible on a pole to the left.

Thank you for your attention

Solar Walking House

Source: [www.n55.dk](http://www.n55.dk)