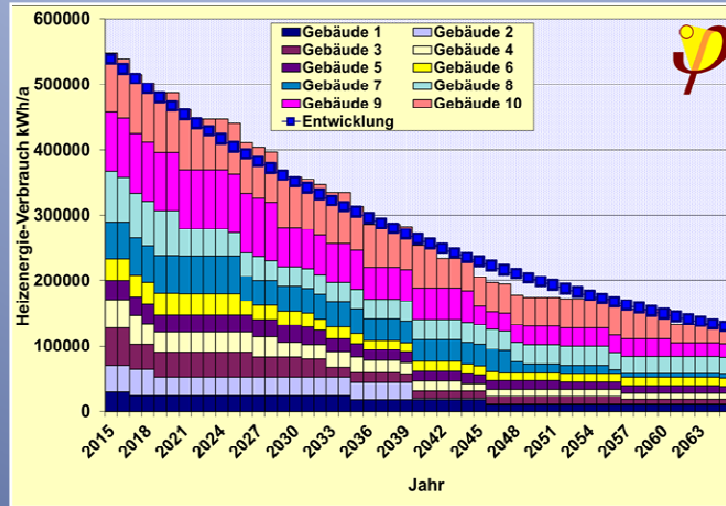


Sustainable Economy ... the Case for Passive House



Univ.-Prof. Dr. Wolfgang Feist
Universität Innsbruck und Passivhaus Institut



Passive House - Components

- **full functionality for the key purpose** of the Component
- **significantly improved energy efficiency** of the component compared to average quality, combined with
 - much better thermal comfort,
 - better protection of the structure,
 - better noise protection,
 - better air quality,
 - optimized connections to all other relevant components



Univ.-Prof. Dr. Wolfgang Feist
Universität Innsbruck und Passivhaus Institut



Building service
Gebäudetechnik



Total 193

Opaque envelop
Opake Gebäudehülle



Total 73

Transparent Components
Transparente Komponenten



Total 266

Availability



Story of success: Certified components 2014

**COMPONENT
CERTIFICATION**

Passive House Institute

122 new components!

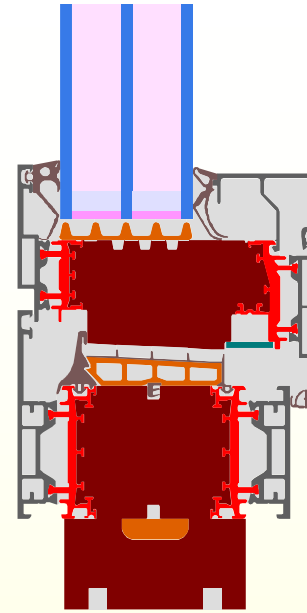
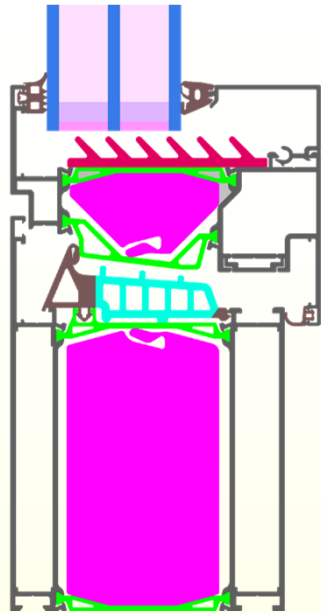


Photo: passivhaus-eco®

1 RAICO

1 PURAL

Price, Company

FRAME 90 WI	REFERENCE	eco90	Product name
492	449 €/m²	540	Price [€/m ² inst.w]
14%		12%	LCC savings [%]
185		230	Oil savings [l/m ²]

Price: Investment costs for ref. building [€/m² inst. window incl. VAT]. Life-Cycle Cost savings: compared to ref. case [%]. Oil savings: per m² window compared to ref. window (life-cycle 40 a)



**COMPONENT
AWARD
2014**

Passive House Institute

EuroPHit

WINNERS: Aluminium (3 participants)

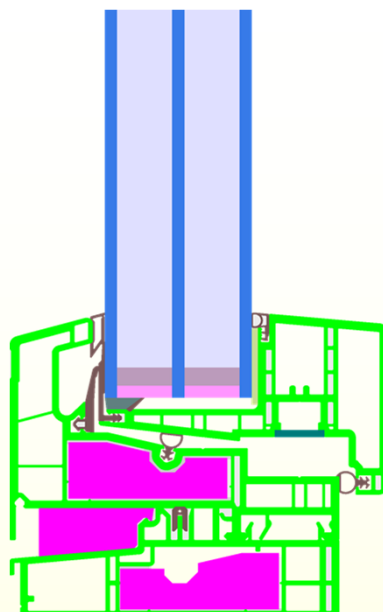


Photo: passivhaus-eco®

1 Hilzinger

Price, Company

	<i>REFERENCE</i>	Product name
VADB 550	298 €/m²	Price [€/m ² inst.w]
296		LCC savings [%]
28%		Oil savings [l/m ²]
257		

Price: Investment costs for ref. building [€/m² inst. window incl. VAT]. Life-Cycle Cost savings: compared to ref. case [%]. Oil savings: per m² window compared to ref. window (life-cycle 40 a)

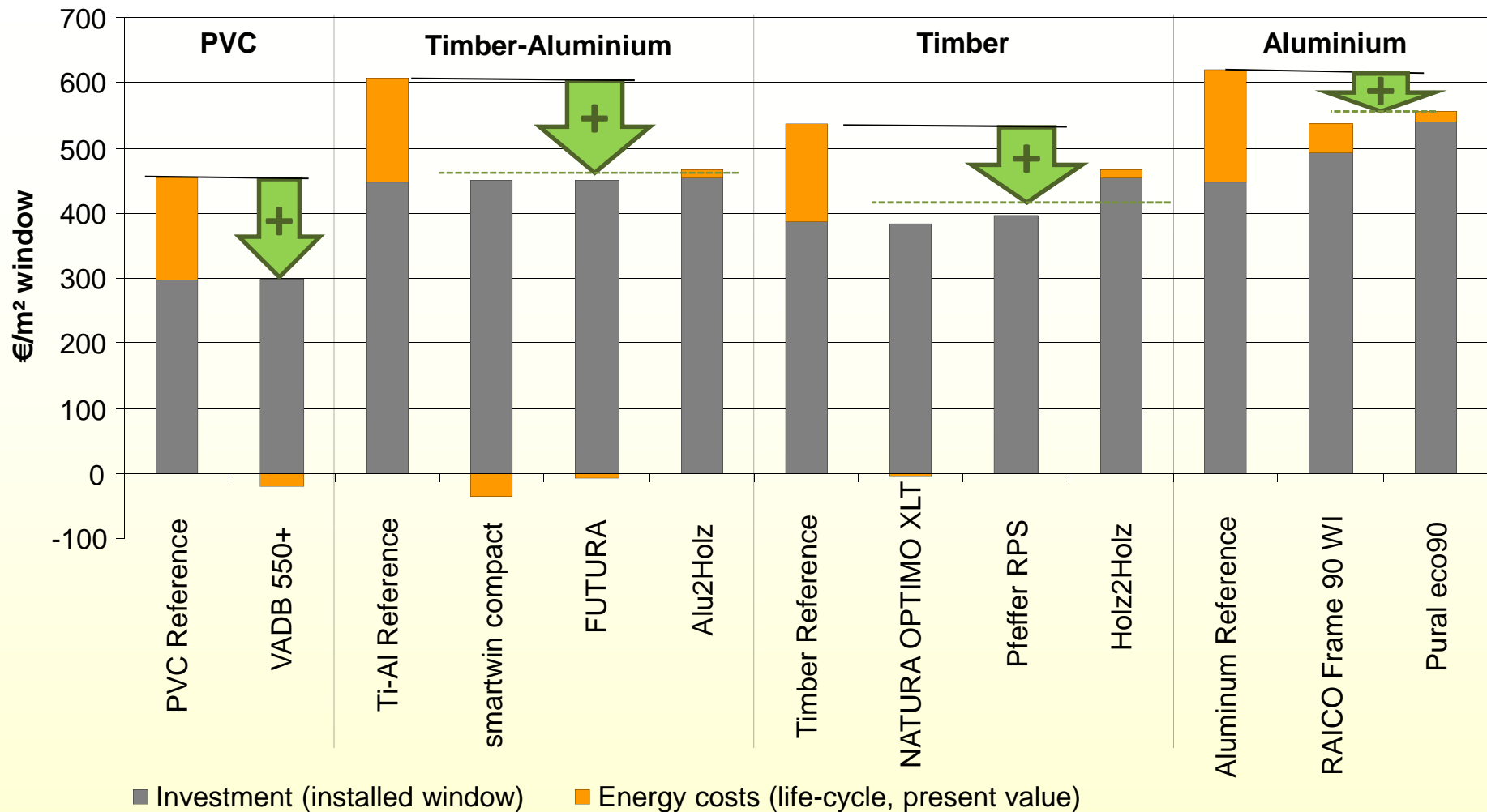


**COMPONENT
AWARD
2014**

Passive House Institute

EuroPHit

WINNER: PVC (3 participants)



Passive House Advantage: better quality

cost reduced from the very beginning ... less than **2.2 €Cent/kWh**

Energy: won't be a problem any longer: it's an energy gaining window

EuroPHit

RESULTS: The winners



**COMPONENT
AWARD
2014**

Passive House Institute

Rockwool Rockframe: *Improve windows towards Passive House*



**Insulating shell form
high dense mineral wool**



**Transparent
Components**
*Transparente
Komponenten*



OUTSTANDING SOLUTIONS



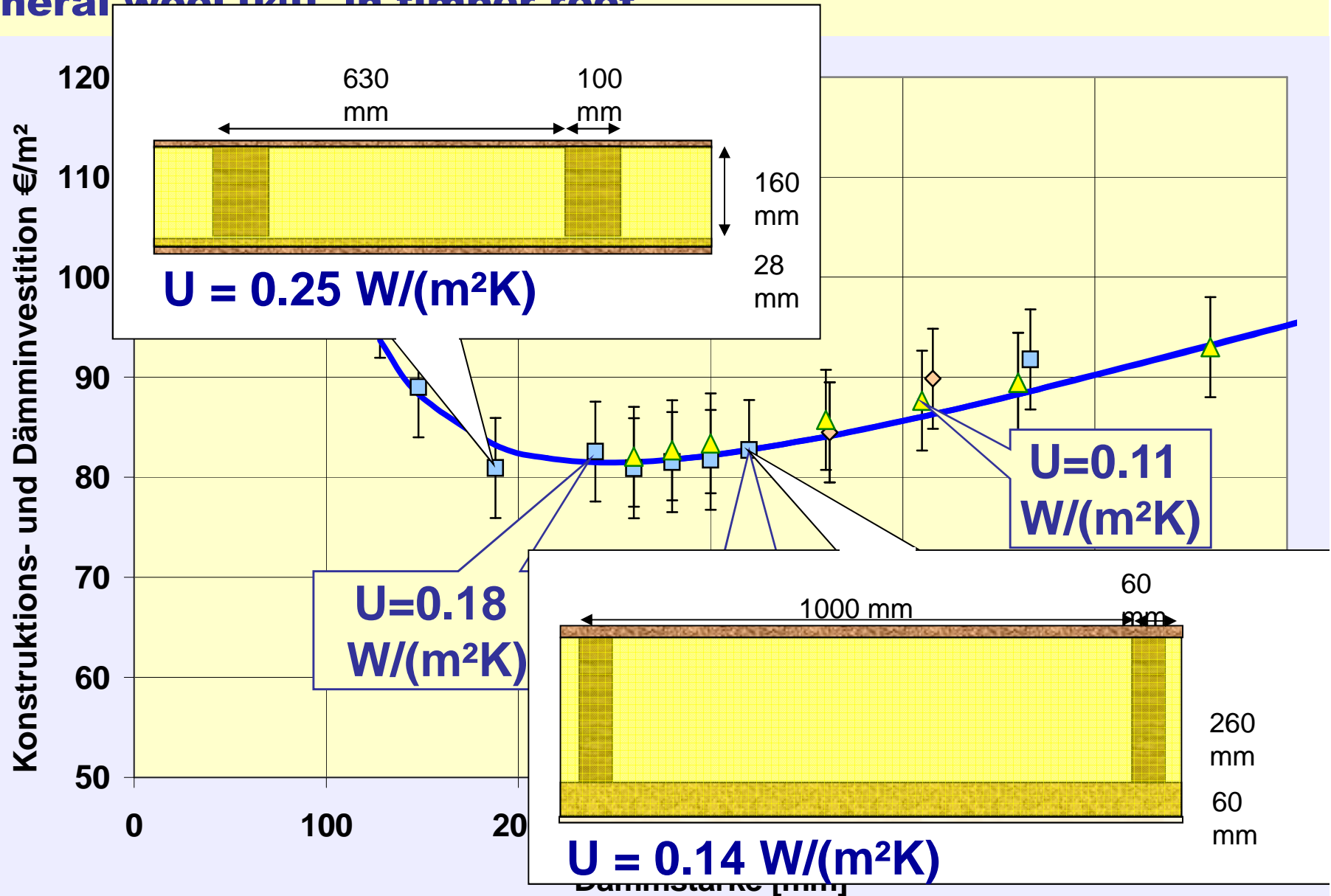
**COMPONENT
CERTIFICATION**

Passive House Institute

Story of success: Certified components 2014

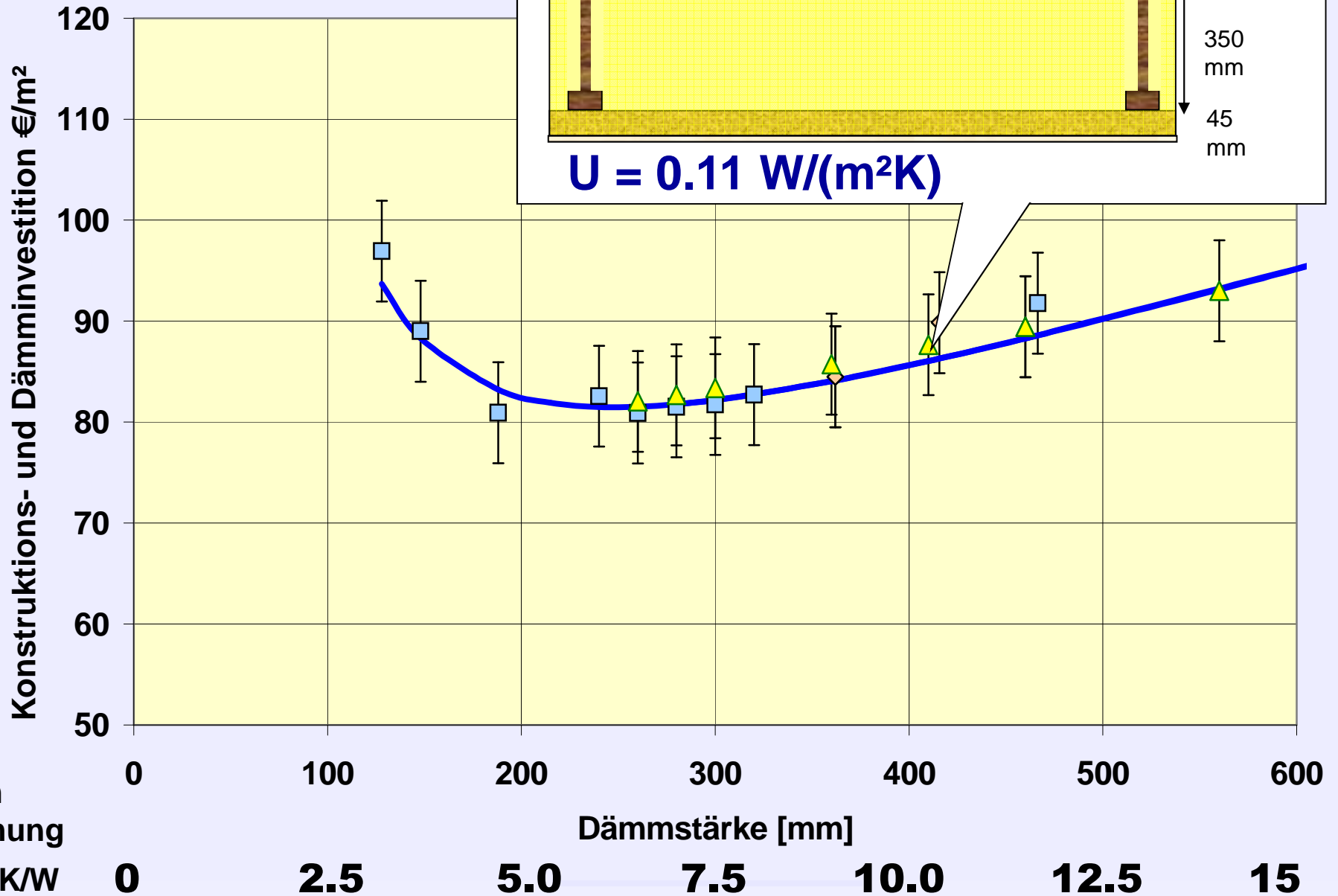
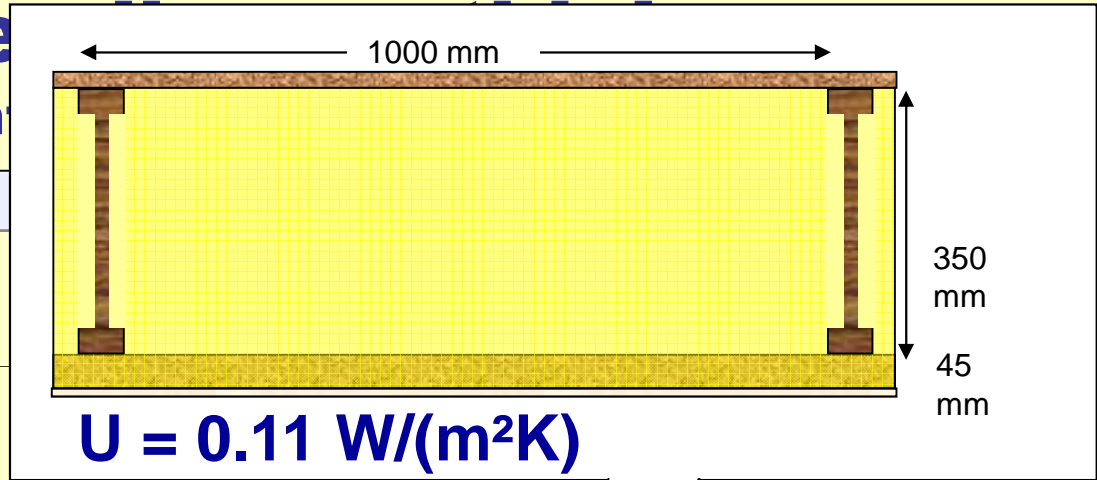
Investment depending on roof construction

Mineral wool 040 in timber roof



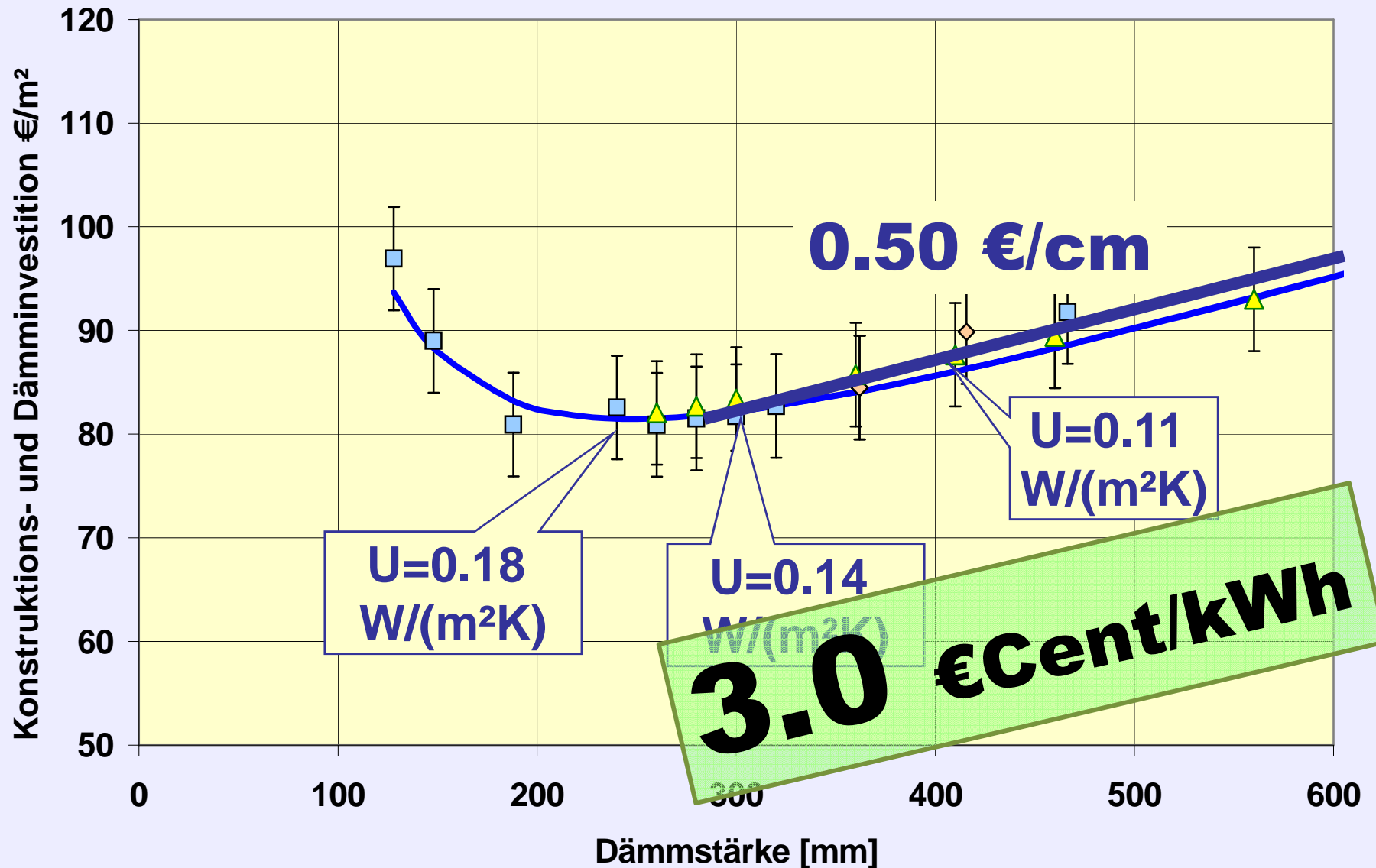
Investment depe

Mineral wool 040, differen



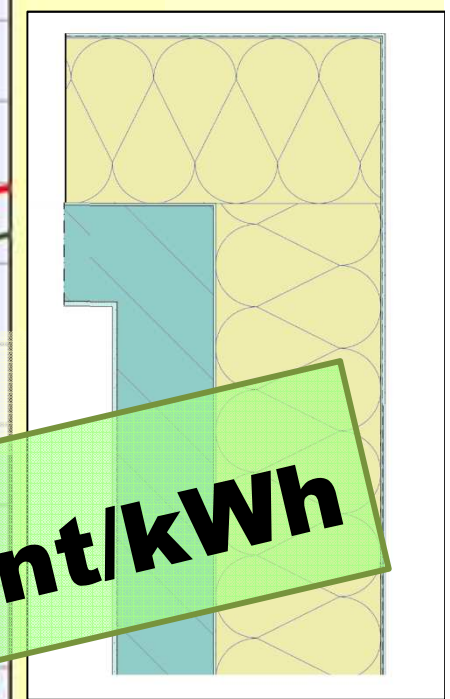
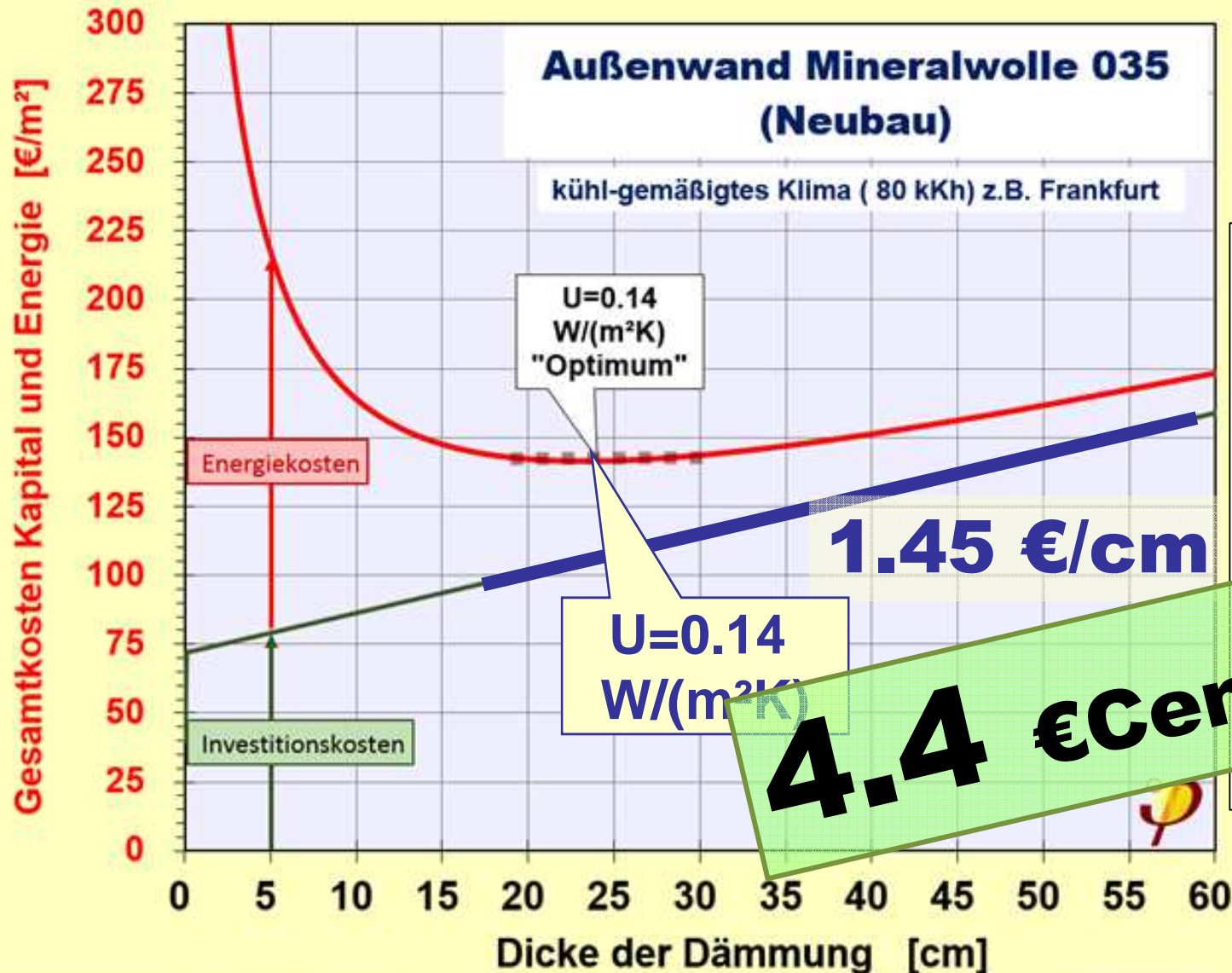
Investment and thickness

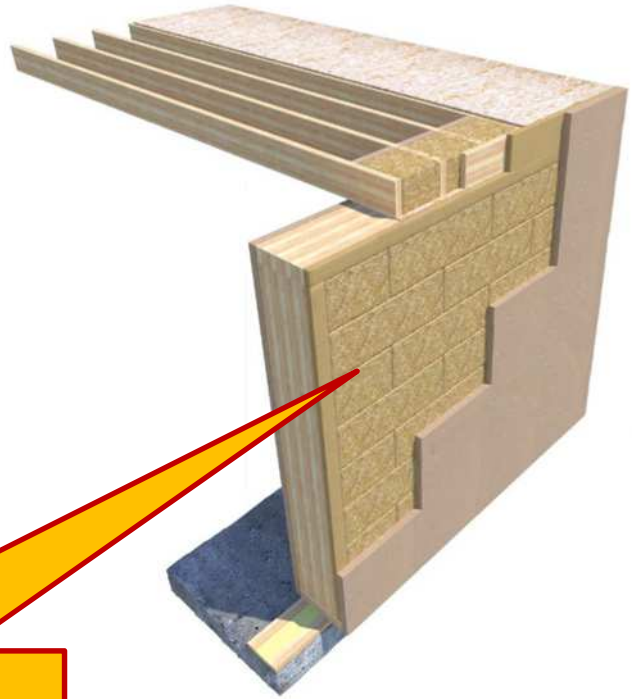
Mineral wool 040



Cost of insulating wall construction

Mineral wool 035, external wall construction





**Insulation from the fields:
1st certified building system with Straw bales**



**Opaque
envelop
*Opake
Gebäudehülle***

OUTSTANDING SOLUTIONS: STRAW BALE

Story of success: Certified components 2014

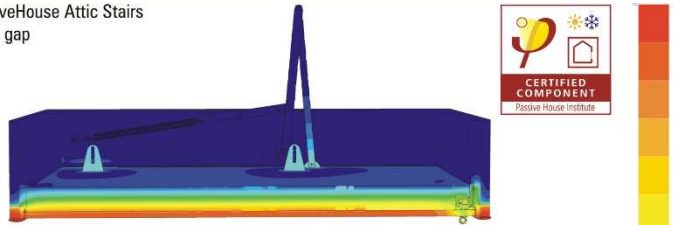


Wellhöfer Treppen GmbH: Passivehouse Attic stairs

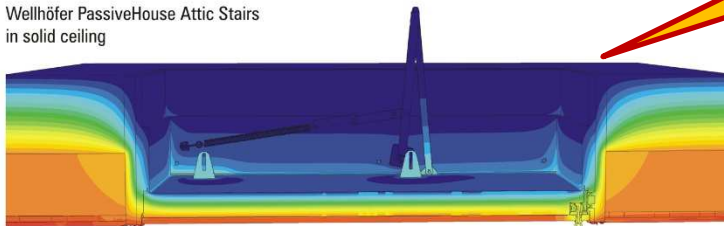
First certified attic staircase

- $U_D = 0,77 \text{ W}/(\text{m}^2\text{K})$
- $U_{D, \text{installed}} < 1,10 \text{ W}/(\text{m}^2\text{K})$

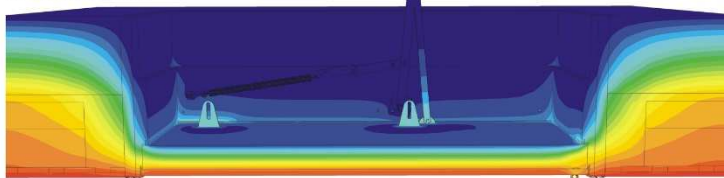
Wellhöfer PassiveHouse Attic Stairs
incl. installation gap



Wellhöfer PassiveHouse Attic Stairs
in solid ceiling



Wellhöfer PassiveHouse Attic Stairs
in wood joist ceiling



Figures: Passive House Institute, isotherms and temperatures, certified component PassiveHouse Attic Stairs



Chances for Small Businesses



COMPONENT
CERTIFICATION

Passive House Institute

Story of success: Certified components 2014



Integration in
the façade

ign

Integration in
the façade

design
gration

Integration in
the façade

Flat design for
good
integration



**Building
service
Gebäude-
technik**

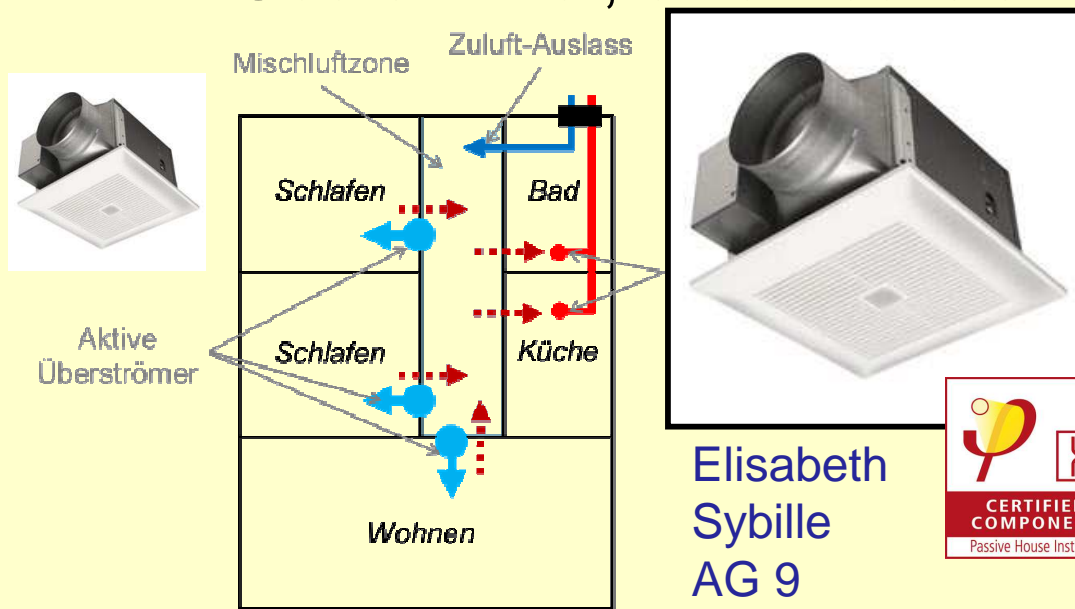
some 8 €Cent/kWh



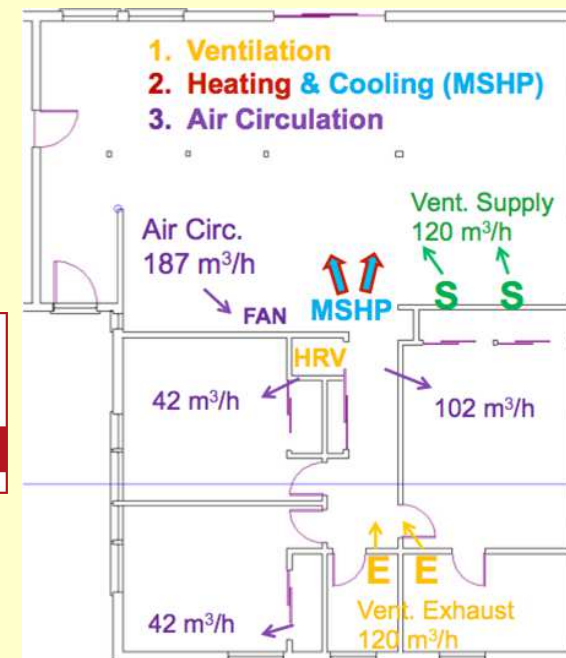
VENTILATION heat recovery units

Heating- and Cooling-Systems for Passive Buildings

- ✓ Möglichst einfache und platzsparende Lösungen gefragt
- ✓ → Kompaktgeräte
- ✓ Art der Wärmeverteilung egal
- ✓ Kleine Heizkörper, kurzes Verteilnetz, Zuluftheizung, Überströmer, eine Decke aktivieren



Elisabeth
Sybille
AG 9



Allen
Gilliland
AG 9

Keep it simple. stupid

Passive House - Components

- exceptional better energy efficiency:
pays off for the whole investment
- But also: better thermal Comfort,
- Improved Connections
- regional production – can be done everywhere
- No limited resources, sustainable
- Already now attractive to substitute fossil fuels



EASME
Executive Agency for SMEs

Univ.-Prof. Dr. Wolfgang Feist
Universität Innsbruck und Passivhaus Institut



Design a Passive House in 3D!

1. setup Sketchup and **designPH**
2. draw your project as usually
3. automatic recognition of temperature zones building elements and area groups
4. import data into **PHPP**
5. finetuning data in **PHPP**

designPH 

new PHPP9 (2015)



Passivhaus Nachweis

Passivhaus - Endhaus Kranichsteine

Objekt: **Passivhaus - Endhaus Kranichsteine**
 Straße: **D-64289 Darmstadt**
 PLZ/Ort: **D-64289 Darmstadt**
 Land: **Deutschland/Hessen**
 Objekt-Typ: **Reihenhaus/Wohnungen**
 Klima: **Deutsches PHPP-Standard** (siehe Gebäudesart (m. J. MW))
 Bauherrschaft: **Bauherrengemeinschaft Passivhaus**
 Straße: **D-64289 Darmstadt**
 PLZ/Ort: **D-64289 Darmstadt**
 Architektur: **Prof. Dott/Ridder/Westermayer**
 Straße: **Jahnstr. 9**
 PLZ/Ort: **D-64285 Darmstadt**
 Haartechnik: **Georg Dipl.-Ing. Norbert Staw**
 Straße: **D-64319 Pfungstadt**
 PLZ/Ort: **D-64319 Pfungstadt**

Baujahr: **1991** Innentemperatur Winter: **20,0** °C Umbautes Vol. V.m.: **665,0**
 Zahl VZ: **1** Innentemperatur Sommer: **25,0** °C Mechanische Kühlung:
 Personenzahl: **4,5** Interne Wärmequellen Winter: **2,1** W/m²
 spec. Kapazität: **201** kWh pro m² WL (dts Sommer) W/m²

Gebäudekennwerte mit Bezug auf Energiezugfläche und Jahr			
	Energiezugfläche	Anforderungen	Erfüllt?
Heizen	Heizwärmebedarf	14 kWh/(m²a)	10 kWh/(m²a) <input checked="" type="checkbox"/>
	Heizlast	10 W/m²	10 W/m² <input checked="" type="checkbox"/>
Kühlen	Kühlbedarf gesamt	kWh/(m²a)	- <input type="checkbox"/>
	Kühlleistung	W/m²	- <input type="checkbox"/>
Primärenergie	Übertemperaturhäufigkeit (P 25 °C)	3,6 %	- <input type="checkbox"/>
	Heizen, Kühlen, Lüftung, WW, Warmwasser, Lüftung, Geräte, WW, Heizung und Hilfsstrom	76 kWh/(m²a)	120 kWh/(m²a) <input checked="" type="checkbox"/>
	FC-Einsparung durch lokal erzeugten Strom	41 kWh/(m²a)	- <input type="checkbox"/>
Luftdichtheit	FC-Einsparung durch lokal erzeugten Strom	25 kWh/(m²a)	- <input type="checkbox"/>
	Luftdichtest-Luftwechsel n50	0,2 1/h	0,6 1/h <input checked="" type="checkbox"/>

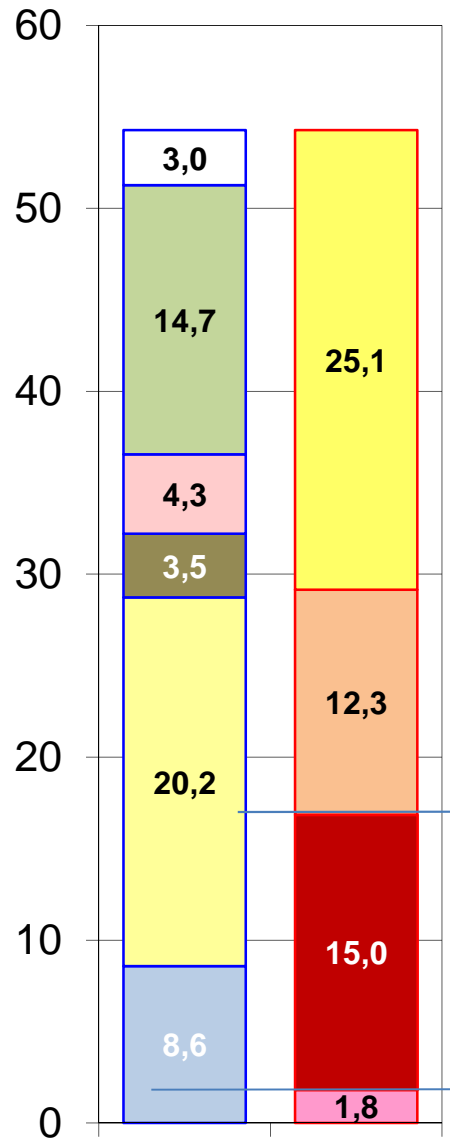
Passivhaus?

Wir versichern, dass die hier angegebenen Werte nach dem Verfahren PHPP auf Basis der Kennwerte des Gebäudes ermittelt wurden. Die Berechnungen mit dem PHPP liegen diesem Antrag bei.

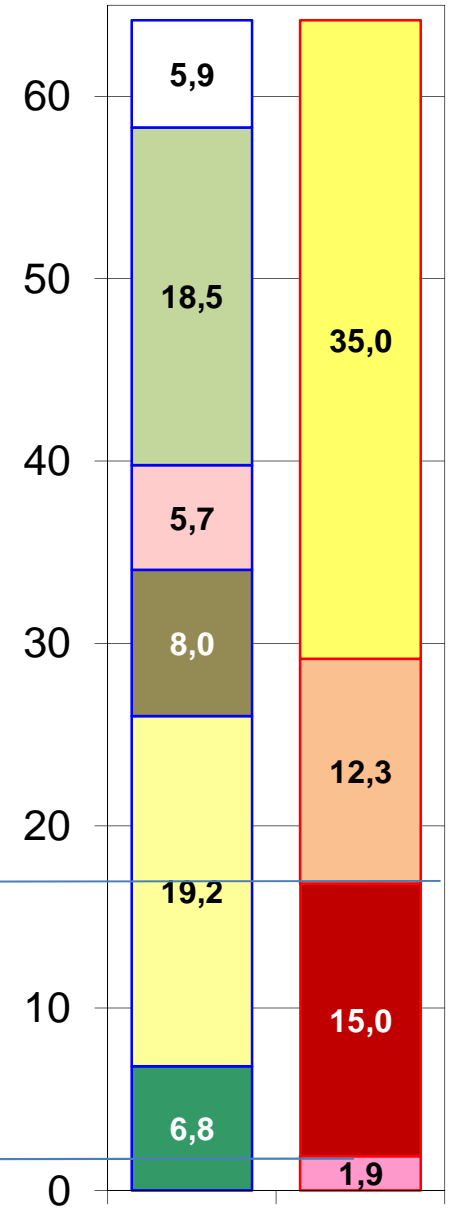
Vorname:
 Nachname:
 Firma:

PHPP Version 8.1
 Registrierungsnummer PHPP:
 Ausgestellt am:
 Unterschrift:

Heating Energy Balance (kWh/m²a)



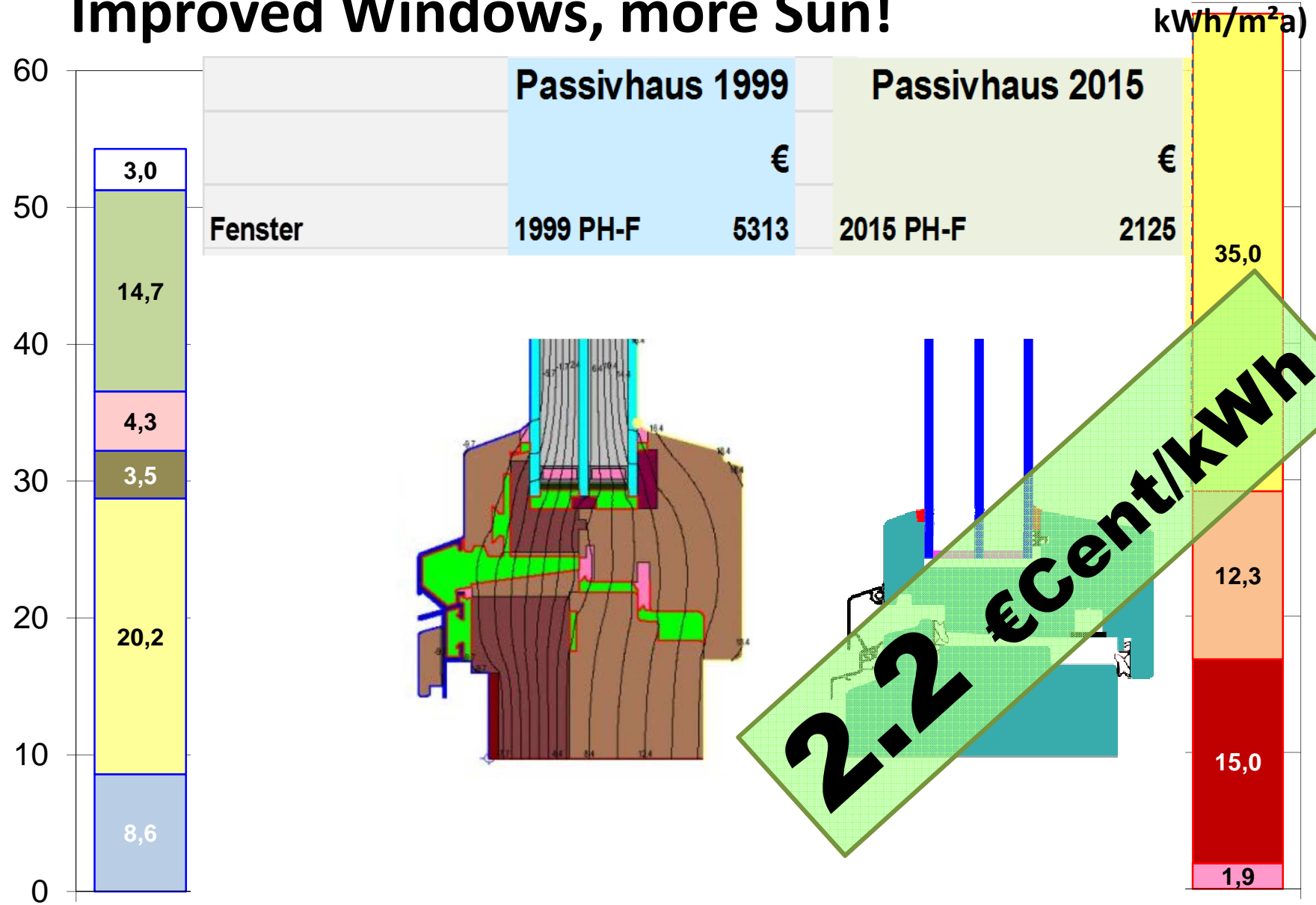
Equal annual heating requirement:
15 kWh/(m²a)



Passive House, 1999

Passive House, 2015!

Improved Windows, more Sun!

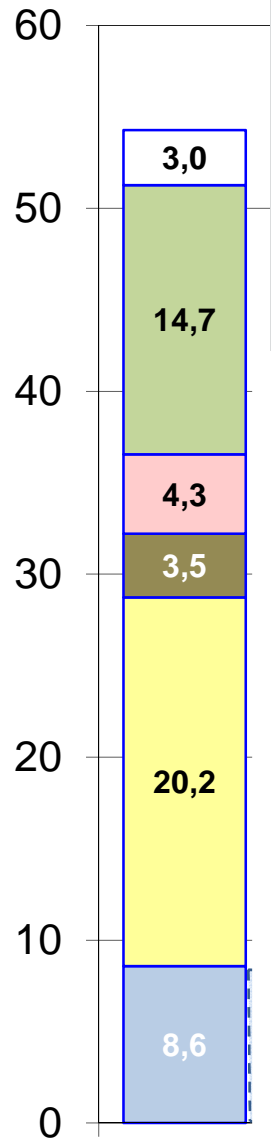


Passivhaus, 1999

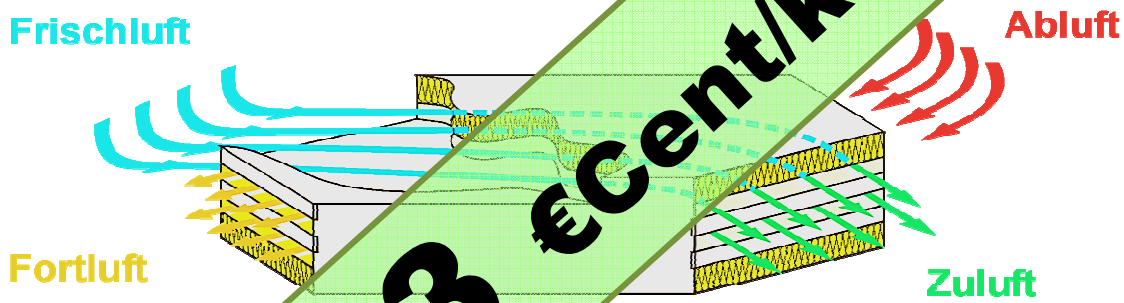
Passivhaus, 2015

2.2 €cent/kWh

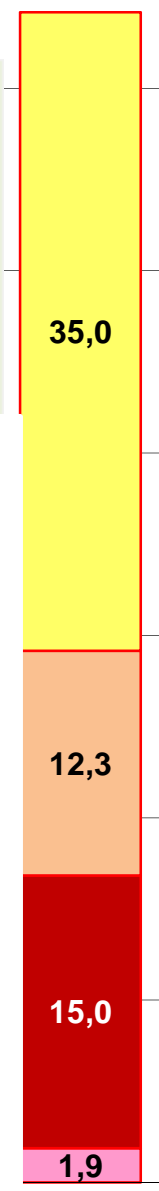
Improved HRV, better air!



	Passivhaus 1999		Passivhaus 2015	
		€		€
Fenster	1999 PH-F	5313	2015 PH-F	2125
Wärmerückgewinnung	80% WRG	7020	2015: 88% WRG	5460



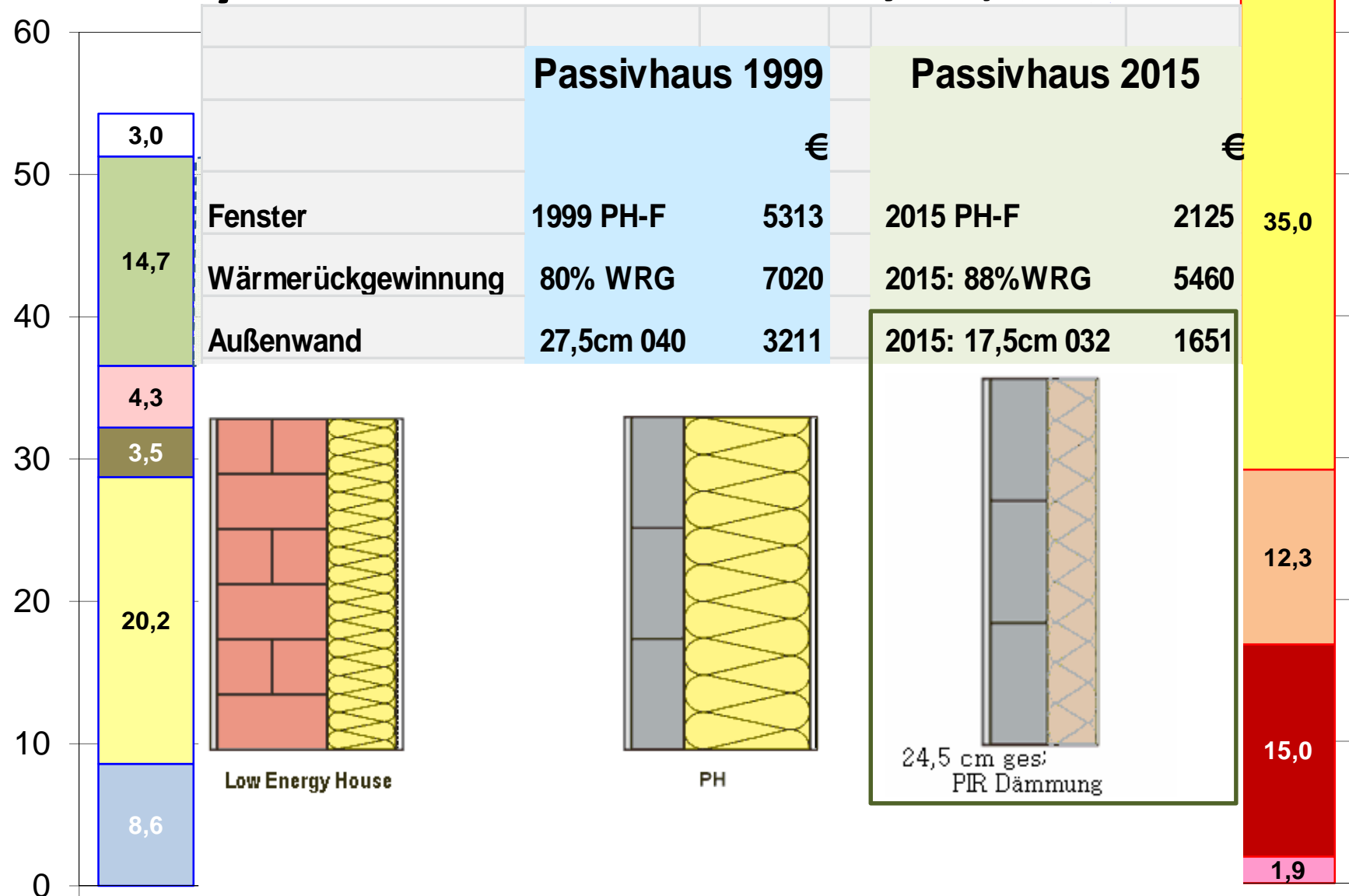
10.3 €cent/kWh



Passivhaus, 1999

Passivhaus, 2015

Need only reduced Insulation! only 17,5cm (kWh/m²a)

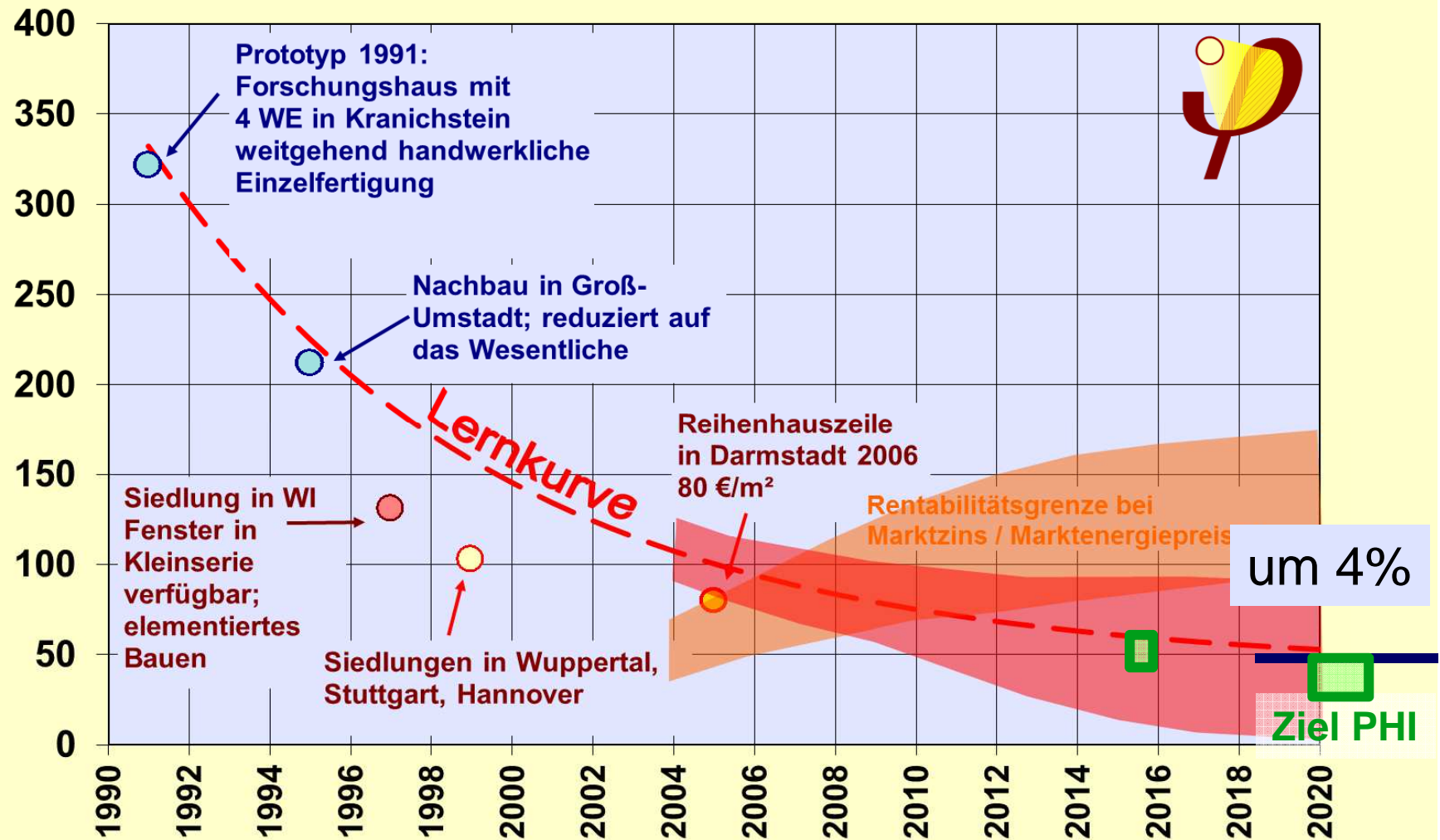


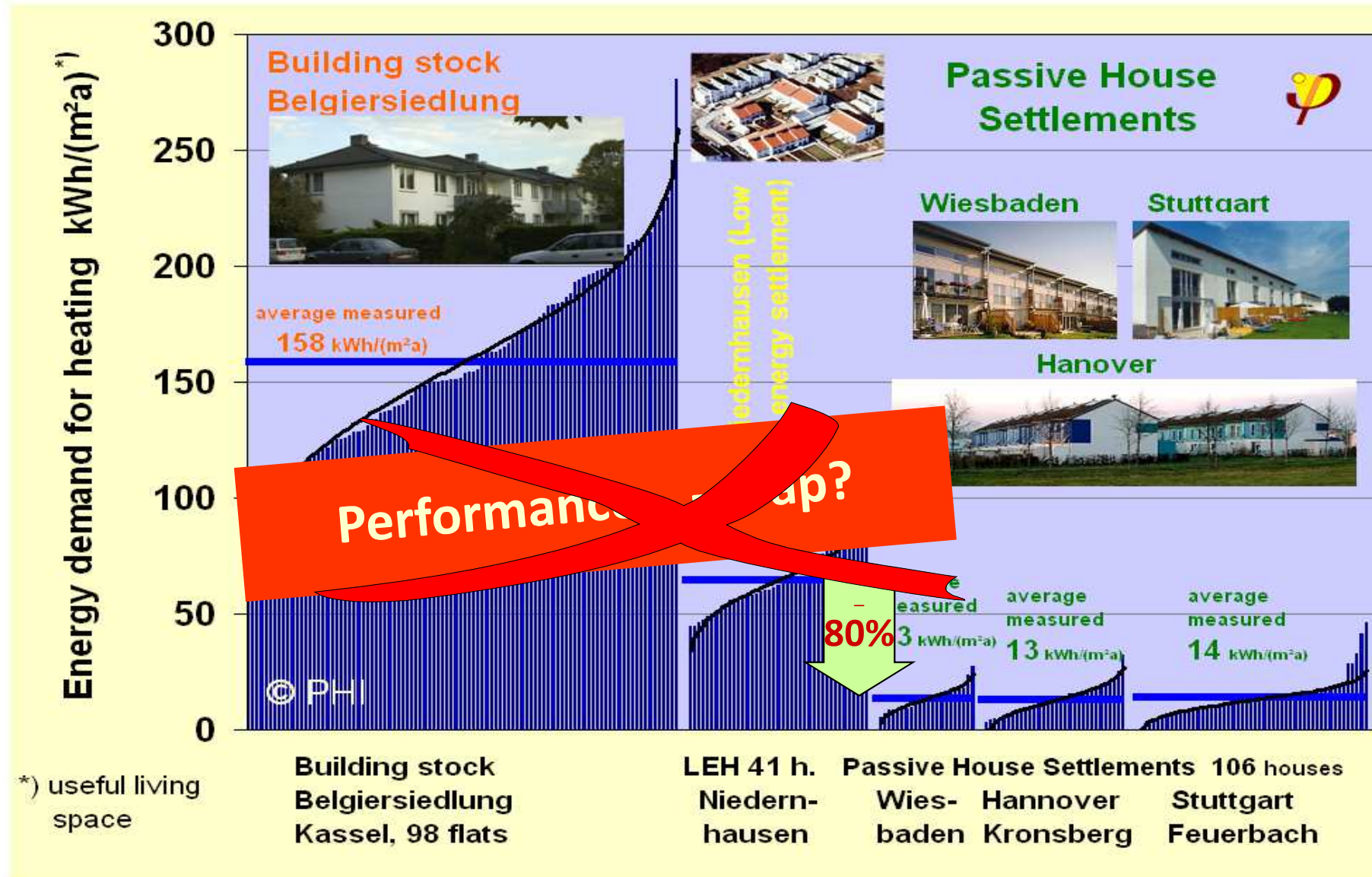
Passivhaus, 1999

Passivhaus, 2015

Learning curve

spezifische Mehrinvestition (€/m²) von Passiv-Reihenhäusern





New Passive House Categories

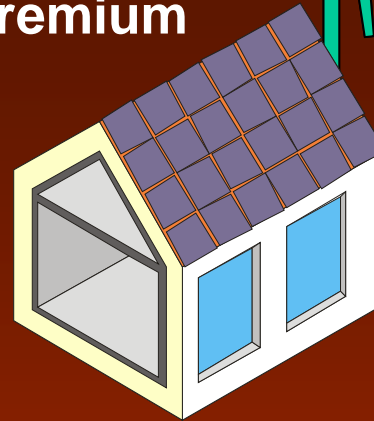
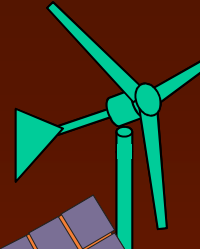


120

Energy Generation
[kWh_{PER}/(m²_{ground}*a)]

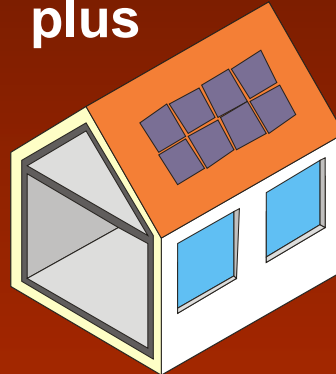
60

premium



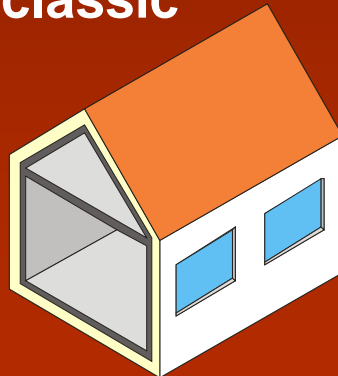
30

plus



45

classic



Energy Demand
[kWh_{PER}/(m²_{tfa}*a)]

60

Efficiency and Renewables – The Dream Team

Passive Houses all Around the Globe



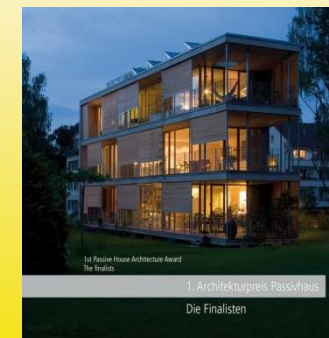
19TH INTERNATIONAL PASSIVE HOUSE CONFERENCE 2015

Congress-Center Leipzig

17-18 April, 2015

with exhibition and
framework programme

(15 – 19 April 2015)



www.passivehouseconference.org