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Architects & Engineers
House of the future!

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Explorer Passive Hotels – A Story of success

Herz&Lang passive house backround:

Building Physics, Consulting, Certification, Training, Monitoring

1 Billion Euro investment in PH buildings consulted

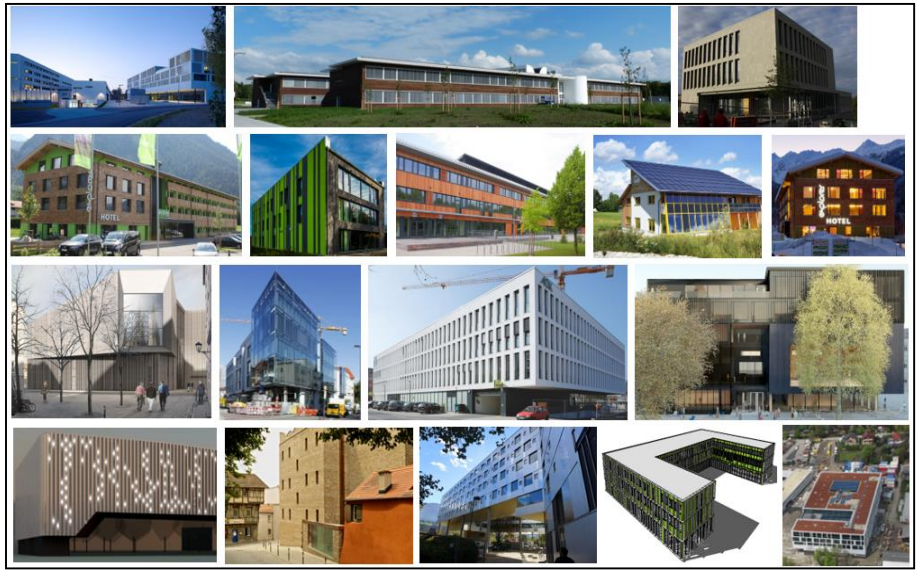
>2.000 Residential units

>300,000 m² TFA non residential / 10 PH Hotels

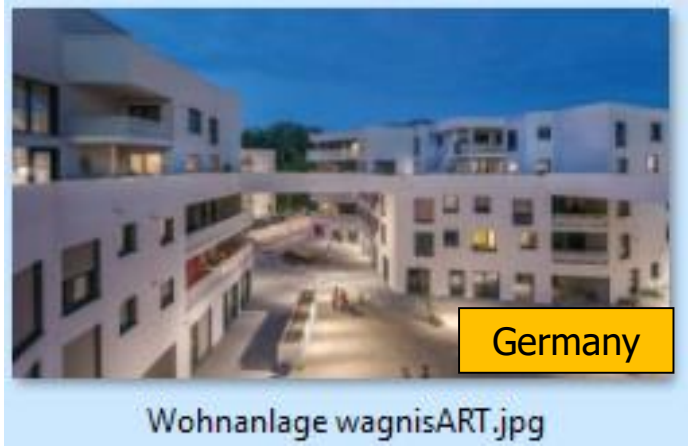
Different clients, teams, use - Essentially pilot projects

Residential

Non residential



Passive House Certification, international



1495 UNIVERSITY OF ABERDEEN

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Passiv Explorer Hotels TARGETS

Stand Januar 2019

Location: All year high value for leisure time in an alpine region

Building: Passivhaus certified, NetZeroEmission, real sustainable in use

Hotel: Perfect price-value-ratio, flexible, comfortable, modern

source: Explorer Hotels, google

Why Passivhaus and focussing on generations >50 years ?

Explorer Hotels Motivation:

Unique characteristic for a

- new, real sustainable hotel concept
- adaptable to several alpine locations
- 365 days season
- high quality performances
- long-term attractive prices !

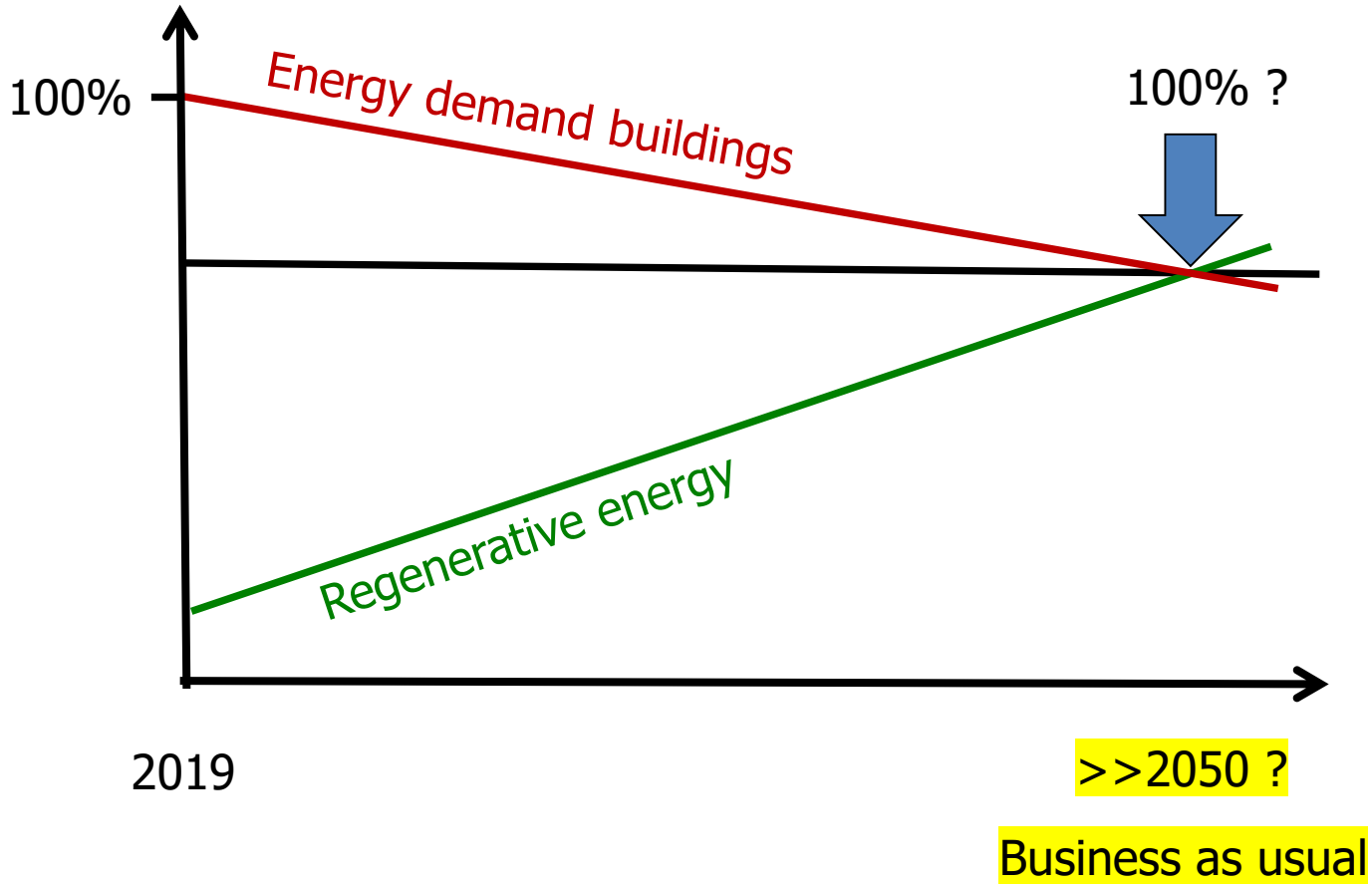
One part of the branding is passiv house standard, high comfort and low costs for maintenance.

The challenge for all, was to start the process „Passivhotel" and to ensure an economic result.

Sources: Different

Simple formula for sustainability

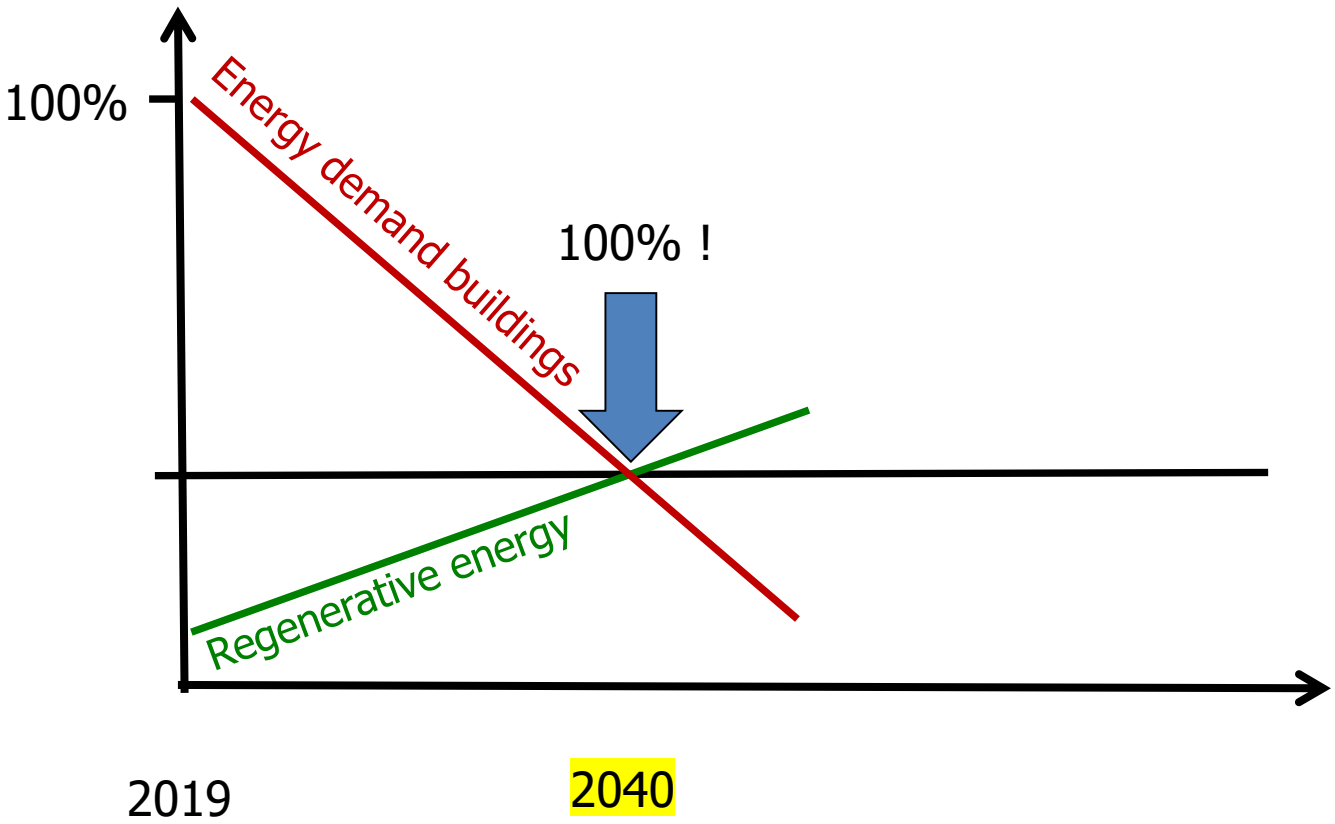
Save energy + produce it 100% regenerative



Source: Herz&Lang

Optimised formula for sustainability

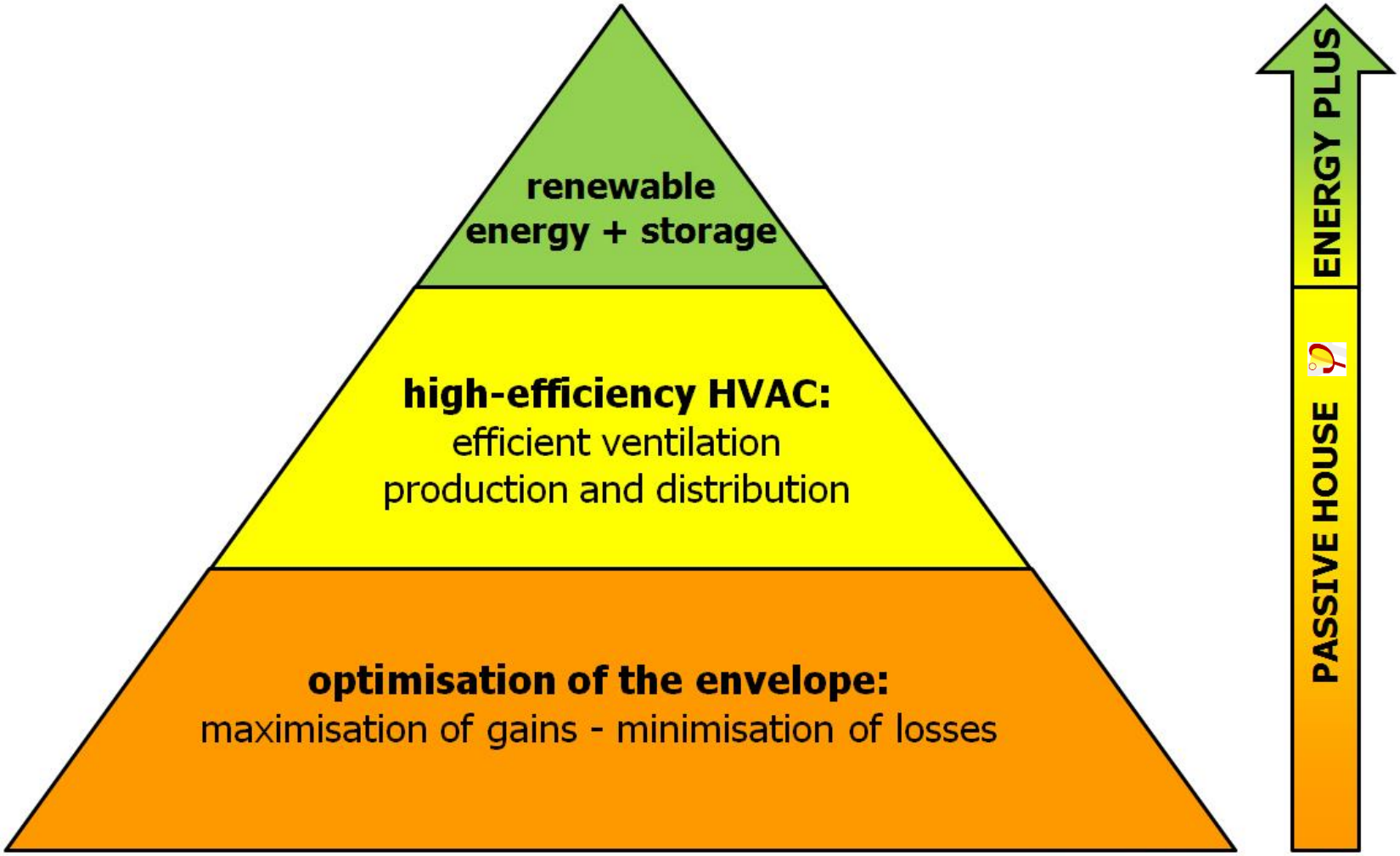
Save maximum energy + produce the rest 100% regenerative



Using PH standards

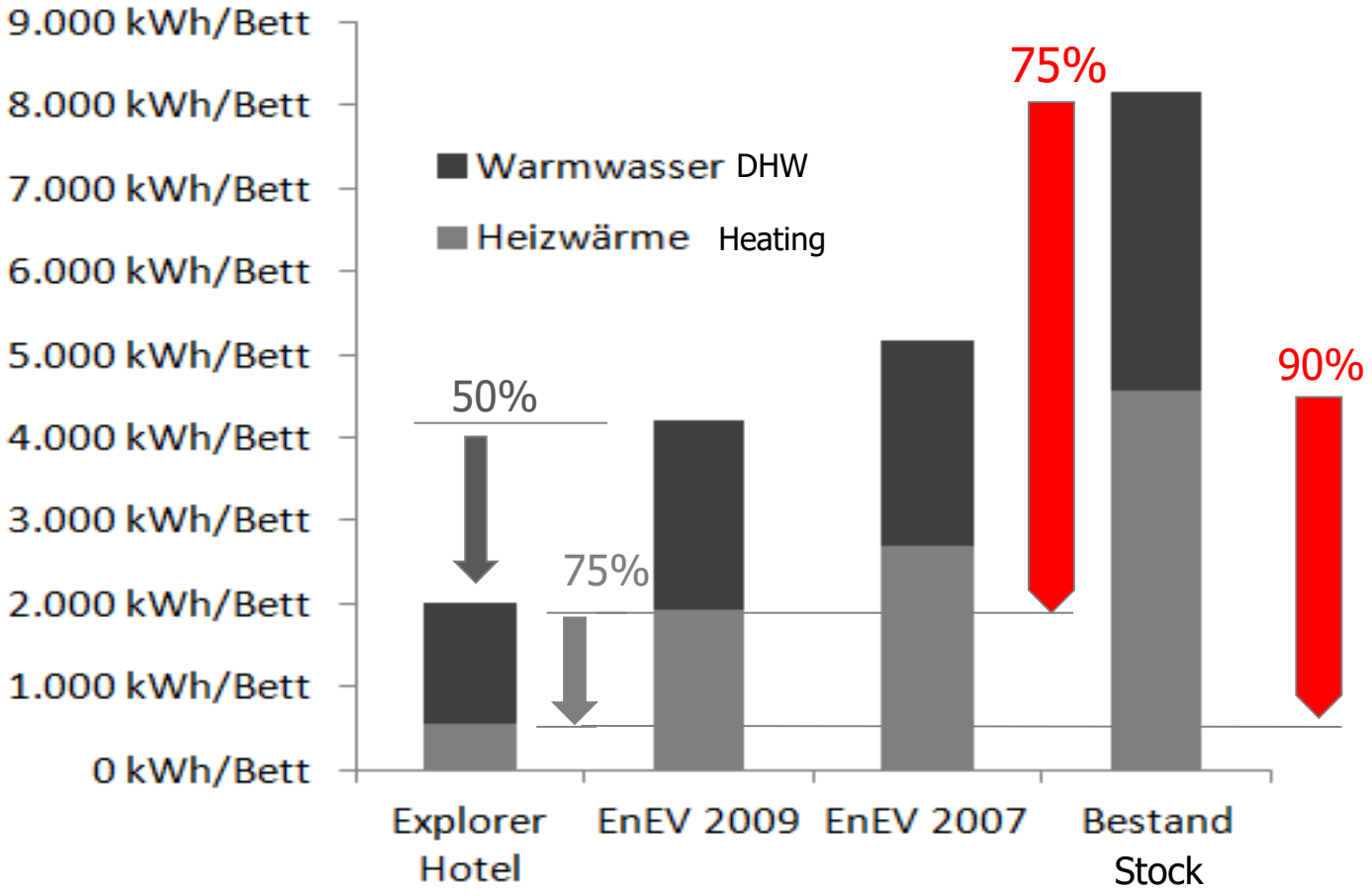
Source: Herz&Lang

The sustainable way for Energy Transition



Source: Herz & Lang GmbH

Benchmarks Hotels 3-4 Stars BENEFITS PASSIVHOTEL



source: Bundesministerium, Herz&Lang GmbH

Explorer Hotel I Oberstdorf / Fischen
Start: PILOT-PROJECT PASSIVHOTEL

Dec 2009: First Buildings design was finished to go for permission – Stop for any design !!

Explorer Hotel Group CEO Reisigl got positive information about an employees appartment house of a 5 stars hotel in the region, built in passive house standard, consulted by Herz&Lang

Jan 2010: Invitation for H&L to present PH benefits, risks, possibilities

Feb 2010: Pre-planning Passivhotel PHPP with first main results:

New requirements shell, detail, technique, available regional products

Additional costs (<10%) and reduced maitenance costs to be expected

Advantage: Energy prices increased a long time to a high level – Risks obvious !

April 2010: Decision to built the first Passivhotel worldwide

Decision to charge H&L and to certify the building by PHI

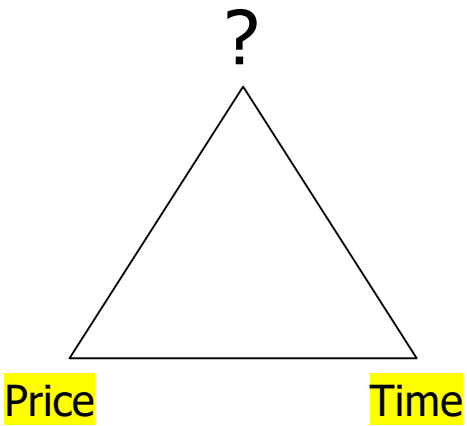
June 2010: Start of construction after 3 months design, high pressure in time

Dec 2010: First guests arrivied Dez 17th

Explorer Hotel Oberstdorf in Fischen
Team

Design team Explorer Hotels / improved German standard

- Investor EXH Group
- Project Management (big, nationwide company, PH-resistant)
- Architects (Phasen 1-8)
- Structural designer
- Building Physics thermal, sound, fire
- Building services designer
- ELT-Planer



First challenge was to create a team, who was able to reach the new targets PH !

It`s easy to build passive houses, you only have to do it the right way !`

- Dr. Wolfgang Feist, Passivhaus Institut

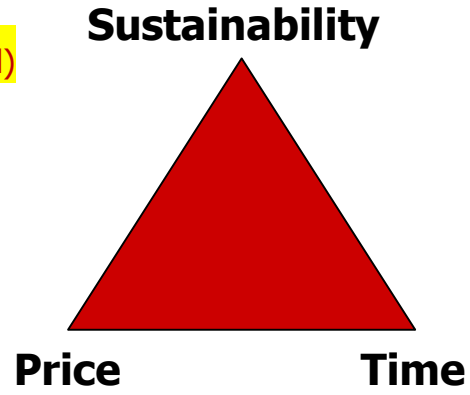
,

Explorer Hotel Oberstdorf in Fischen

Team supplement PH Consulting

Project team **Passivhotel**:

- Investor EXH Group
- Project Management new ! (mid size, regional, PH-open minded)
- Architect (Phasen 1-8)
- Structural designer
- Building Physics sound and fire
- Building services designer new ! (Partner PM)
- ELT-Planer



New: H&L Passivhaus Performances

- Thermal Building Physics (PHPP, heatbridge, national rating, subsidies)
- Consulting (PH Quality Management for designers, builders, users)
- Consulting Measurement BD+TG, documentation, certification (eza!)

Explorer Hotel I / Oberstdorf Allgäu 2010

1. Passivhotel worldwide, PHI-Cerification

Passivhotel

- Economyclass
- 3-Stars
- 76 rooms
- Opening Dec 2010
- 24 more rooms 2019
  HOREX administration

NetZeroBuilding

zertifiziert

GREENBUILDING

Explorer Hotel I / Oberstdorf Allgäu 2010

1. Passivhotel worldwide, PHI-Cerification

- Energy effizient, alpine architecture
  Disadvantages: Unfavorable orientation
  Roofs West/East, gable and fire escape south side
  Location delivers shading by mountains (That`s alpine !)
  Advantages: Orientation favorable for passive shading !

- Compact construction
  Basement, underground garage in cold area
  Simple thermal shell

- TFA = 2.522 m² (PHPP) QH = 13,7 kWh/(m²a)

source: Sieber-Renn Architektur, Herz & Lang GmbH

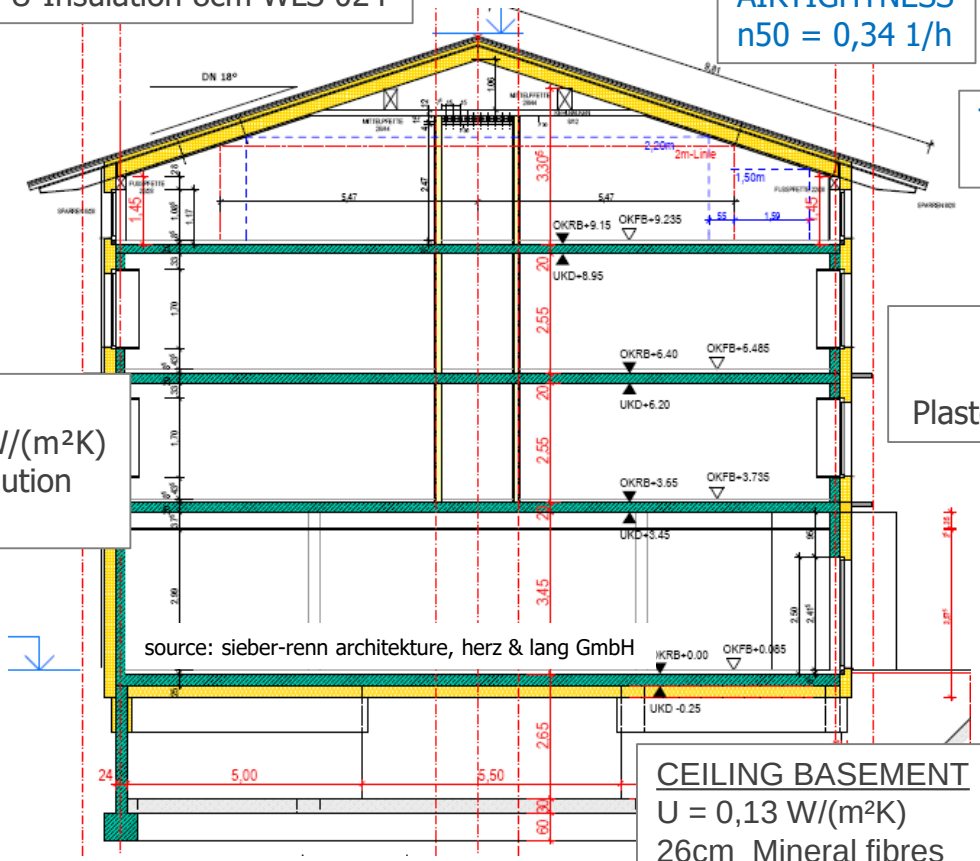
Explorer Hotel I / Oberstdorf Allgäu 2010

High insulated thermal shell

ROOF
U = 0,09 W/(m²K)
MW 28cm WLS 035, PU-Insulation 8cm WLS 024

AIRTIGHTNESS
n50 = 0,34 1/h

THERMAL BRIDGES
Uhb < 0,01 W/(m²K)



source: sieber-renn architekture, herz & lang GmbH

WINDOWS
Uw,installed < 0,85 W/(m²K)
Salamander Blue Evolution
Uf = 0,94 W/(m²K)

FACADE
U = 0,12 – 0,13 W/(m²K)
Plaster, timber and shingles Spruce

CEILING BASEMENT
U = 0,13 W/(m²K)
26cm Mineral fibres

source: Sieber-Renn Architektur, Herz & Lang GmbH

Comfort

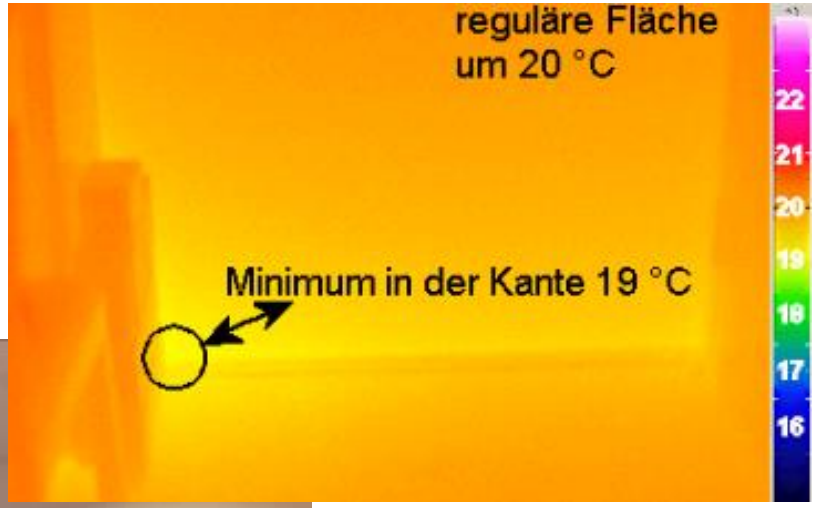


Foto unten: alpenresort schwarz, Foto oben: H.Lübbe

Comfort „What we don't save on is comfort !"

PASSIVHOTEL
365 days Air Spa

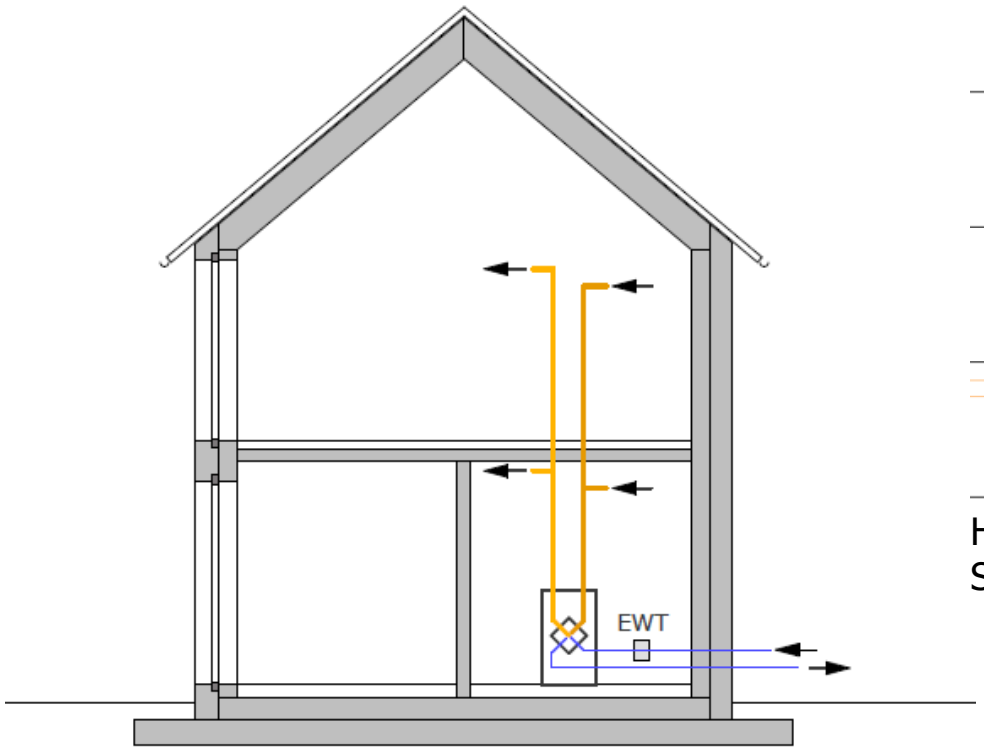
Comfort Ventilation
in all Areas,

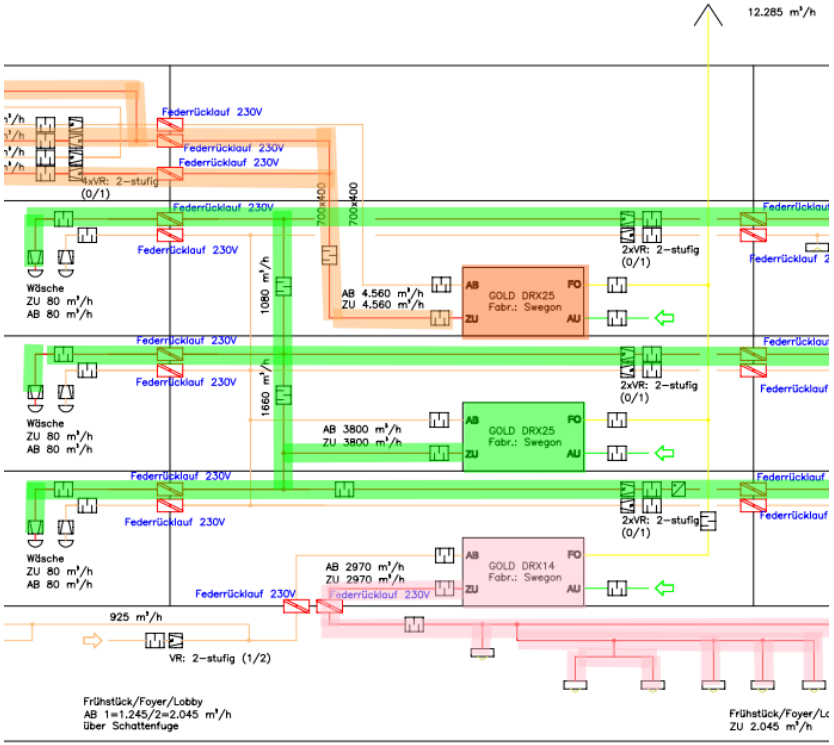
Heat distribution
with radiators

Source: Explorer Hotel

Comfort Ventilation

365 days Air Spa





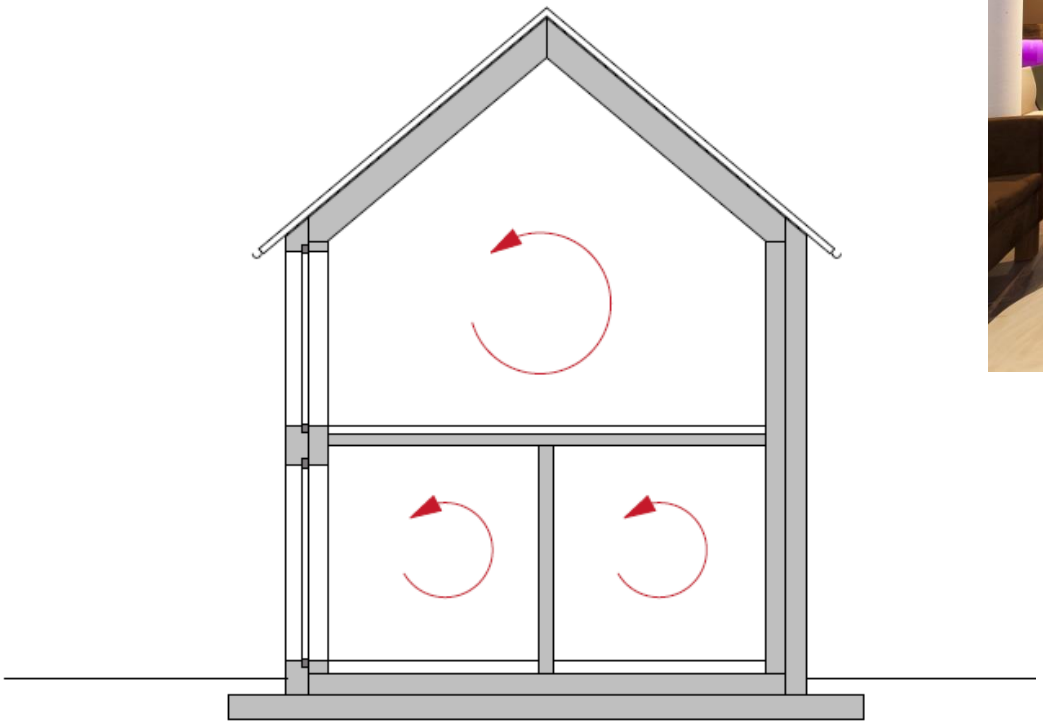
Hocheffiziente Komfortlüftung (WBG 85%)
Swegon Gold, geschoßweise, max 4.000 m3/Gerät

- Comfort
- Healthy air humidity
- Healthy air (VOC, mould,..)
- Energy savings

Source: Herz&Lang, Hörburger

Internal gains – Passive heating

Heat load = 17 W/m²



Important: Master-PHPP developed for Nonres. by Herz&Lang, with different zones of use !
Reason: Zones can be very different in loads. PHPP gives average results of all zones !

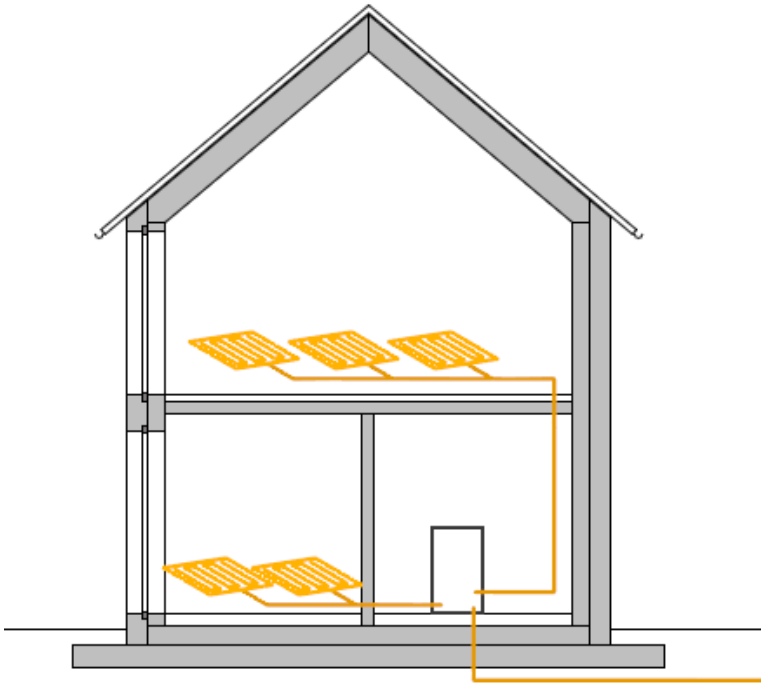
Source: Herz&Lang, Explorer Hotel

Active heating / Rest heat condition

Heating and DHW: Biogas condensing boiler 150 KW + Solar thermal 40 m²
Large buffers for DHW
Radiators in guest rooms
Underfloor heating in Lobby and Restaurant

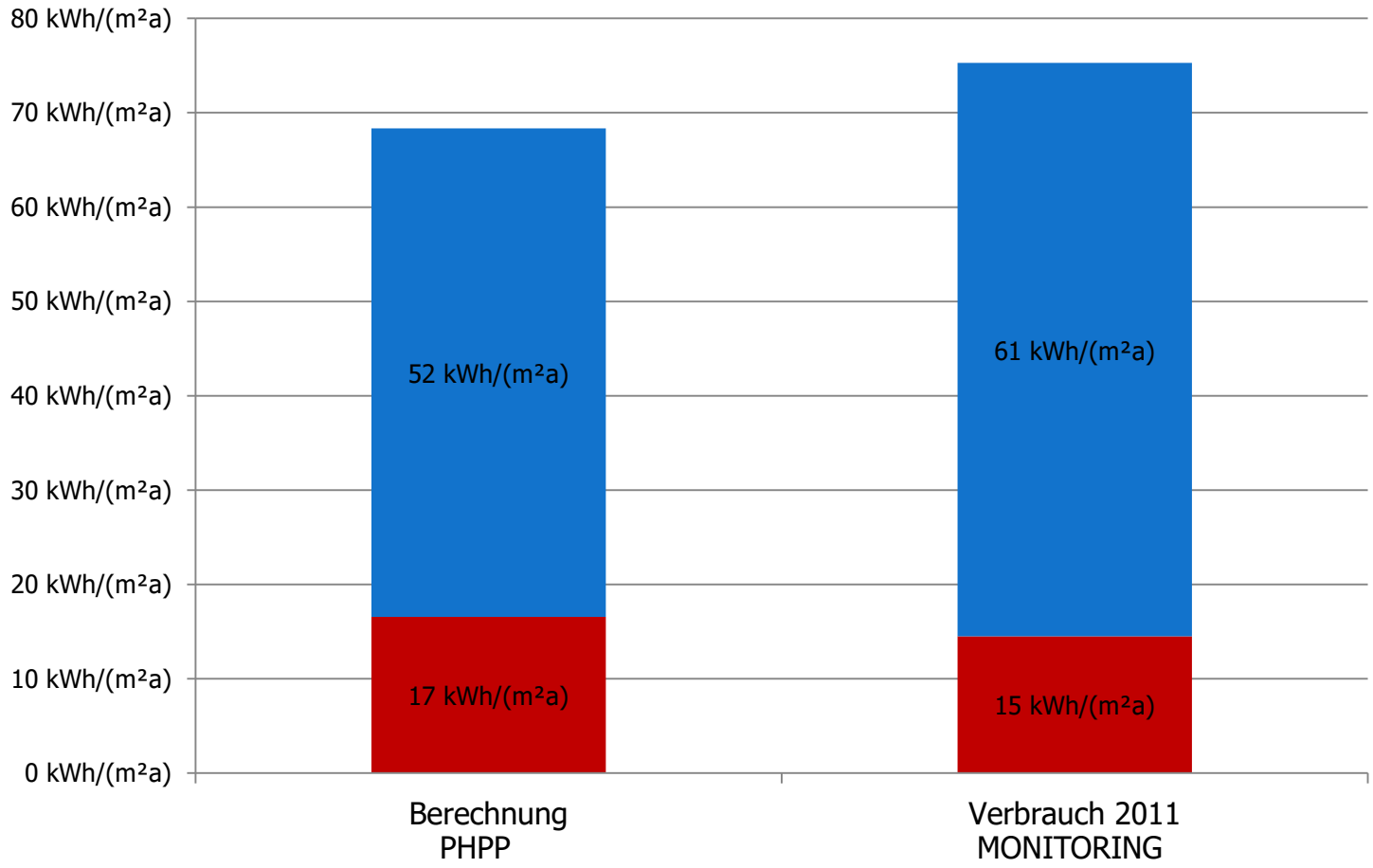
No active shading
No cooling system

<u>Electricity:</u>
PV max. roof area, 105 kW_P
100 % green electricity



Explorer Hotel I / Oberstdorf Allgäu 2010

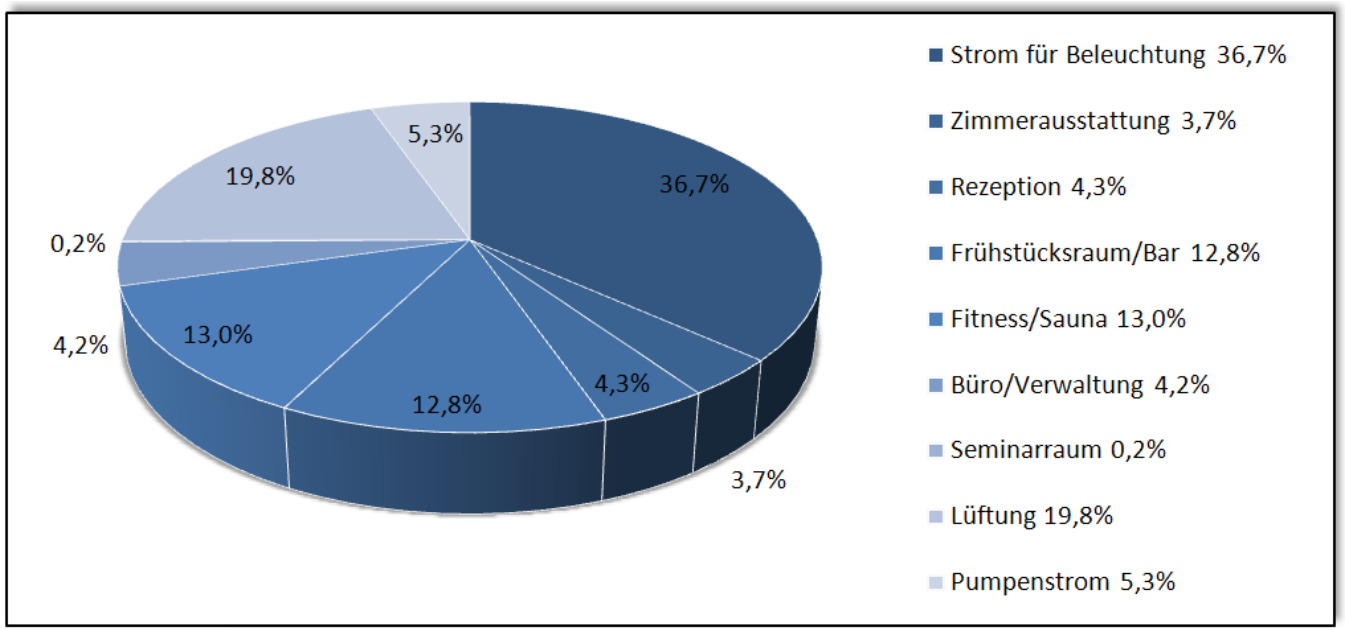
First years results 2011 = Heating -11 % DHW +17%



source: Herz & Lang GmbH, Endenergieverbrauch für Heizung und Warmwasser 2011 in [kWh]

Explorer Hotel I / Oberstdorf Allgäu

Electricity consumers by PHPP



30% of the whole electricity demand 2011 was delivered directly by PV !

Main consumer was light. Designer lights in guest rooms now have been consequently changed to the new generation of LED`s.

source: Herz & Lang GmbH, Endenergieverbrauch für Strom 2011 in [kWh]

Explorer Hotel I/ Oberstdorf Allgäu

NetZeroBuilding - Results 2011

Concept NZB:

1. Minimized Consumption

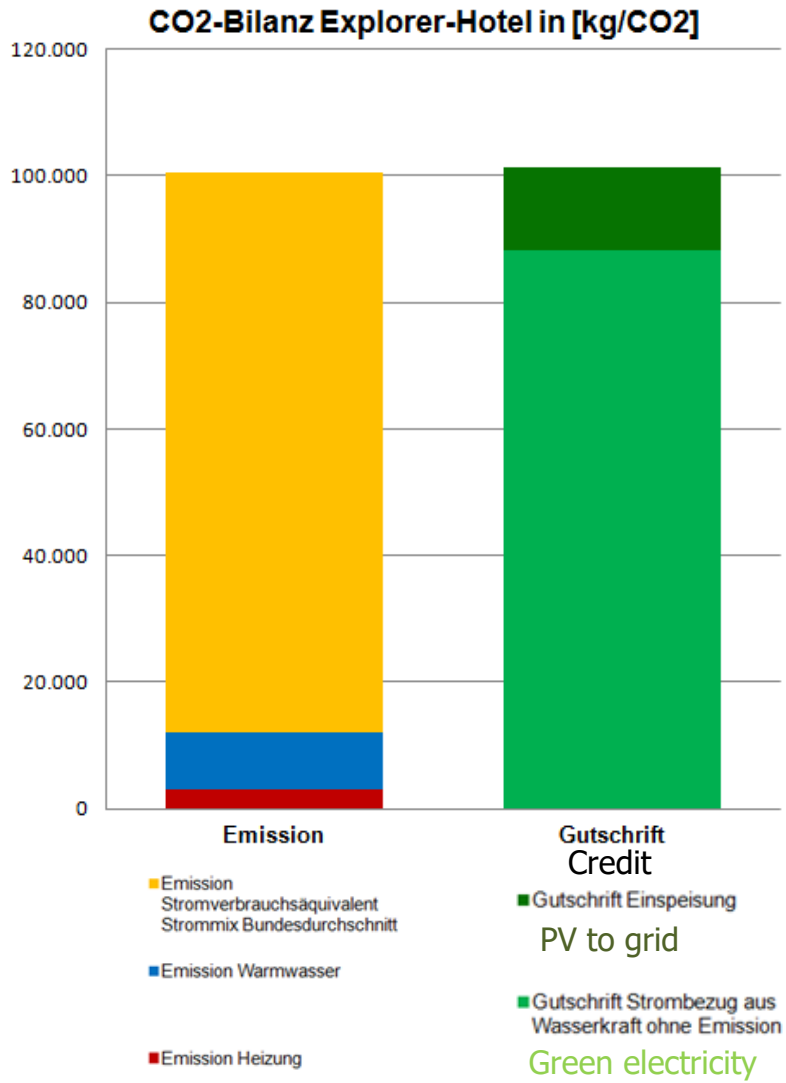
- PH shell
- PH Quality Mangement

2. 100% Regenerative heat

- Thermal Solar
- Biogas, local providers
-

3. 100 % Green electricy

- Photovoltaics, max. self used power
- Rest energy 100% regenerative, Zero CO2, by a local provider



source: Herz⟪ Datensource: Eigentümerverbrauchsdaten 2011

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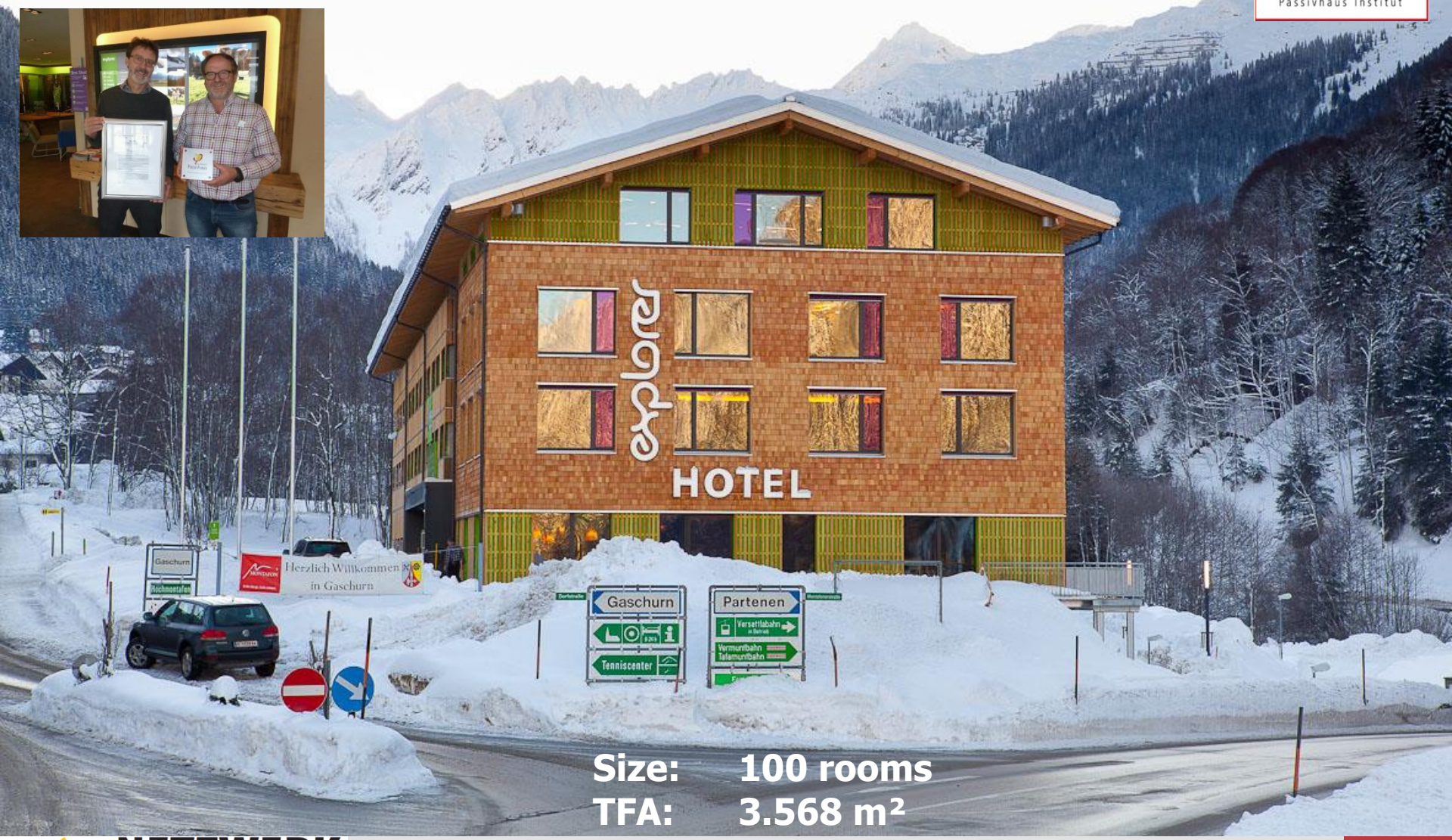
Explorer-Hotel II Montafon Gaschurn /A 2011

1. Passivhotel in Austria with PHI Certificate



Size: 100 rooms
TFA: 3.568 m²

Source: Explorer Hotel

Explorer-Hotel II Montafon Gaschurn /A 2011

1. Passivhotel in Austria with PHI Certificate

Shell: PH-Principles **like Explorer I Oberstdorf**
new! Building services in basement, integrated in thermal shell

Heat/DHW: **new !** Pellets boiler, solar thermal 80 m² (improved)
MVHR **new !** 1 Big size ventilation unit (Bösch) max 17.000 m³/h
(HR $\leq$ 82%) additional fans, air pre-heated
Cooling: **new!** Foyer, Reception passive cooling, soil heat pump, active shading
Airtightness: n50 = 0,30 1/h (EXH I = 0,34 1/h)
Electricity 100% green electricity, **new!** PV added 2015: 61 kWp, 100% to grid

Source: Explorer Hotel

Explorer-Hotel III Neuschwanstein /Allgäu 2013

- **First Passivhotel worldwide constructed in timber (CLT)**
- **Third Passivhotel worldwide with PHI-Certificate**
- **Largest Passivhaus constructed in timber in the region**

Source: Explorer Hotel

Explorer-Hotel III Neuschwanstein /Allgäu 2013

Shell: PH-Principles **like Explorer II Montafon**
new! CLT starts from first floor, 4 storeys,
Stairway, Foyer, Restaurant in concrete construction

Heat/DHW: **new!** Biogas condensing boiler 2x75 KW,
Solar thermal 145 m² improved (Carport)

Cooling: Foyer, Reception passive cooling, soil heat pump, active shading

MVHR: Central unit like Explorer II Montafon

Electricity: PV 157 KWp improved and green electricity like EXH I

Source: Explorer Hotel

Explorer-Hotel III Neuschwanstein /Allgäu 2013

Source: Explorer Hotel

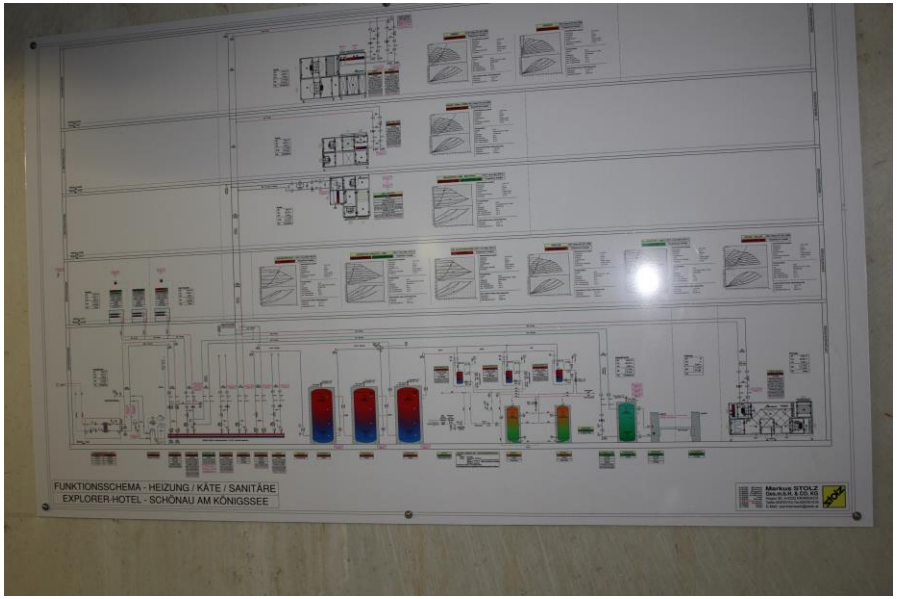
Explorer-Hotel IV Berchtesgaden/Bavaria 2015

Shell: PH-Principles **like Explorer II Montafon**
100% constructed in concrete

Heat/DHW: **new!** Biomass district heating
Cooling: Foyer, Reception passive cooling, soil heat pump, active shading
MVHR: Central unit like Explorer II Montafon
Electricity: PV-Anlage 144 KWp, 100% green electricity
new! 60 kWh Storage

Source: Explorer Hotel

Explorer-Hotel IV Berchtesgaden/Bavaria 2015



Source: Herz&Lang

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Explorer-Hotel V Kitzbühel, St.Johann/Tirol 2016

Shell: PH-Principles **like Explorer II Montafon**

Heat/DHW: Biomass district heating
Cooling: Foyer, Reception passive cooling, soil heat pump, active shading
MVHR: Central unit like Explorer II Montafon
Electricity: 100% green electricity, PV still in option (No EEG in Austria)

Source: Explorer Hotel

Explorer-Hotel VI Zillertal, Kaltenbach/Tirol 2017

Hotel mit Ladengeschoß im EG

Investor: Empl/Kaltenbach

Mieter:
Hotel durch Explorer Hotels

Planer:
Regionales Team
Zertifizierung PHI

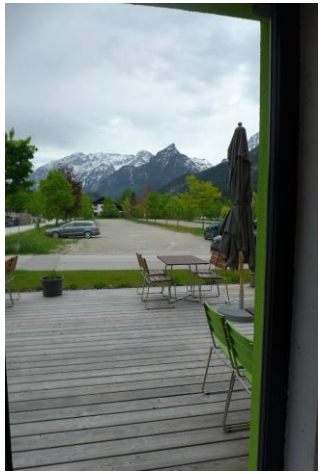
Geschäftsführer Explorer Hotels Jürnjakob Reisigl:
„Wir müssen sehr behutsam mit den Ressourcen- und Energiebedarf umgehen. Gleichzeitig brauchen unsere Gäste aber nicht auf Komfort verzichten, sondern schätzen gerade dieses gute Klima in unseren Häusern. Und als Investor will ich, dass der Wert des Gebäudes so lange wie möglich erhalten bleibt - auch noch in 40 Jahren. Bei unseren Passivhaus-Hotels ist das der Fall."

„Es ist mittlerweile keine Seltenheit mehr, dass sich Destinationen direkt bei uns melden, weil sie auch ein Explorer Hotel haben möchten", sagt Geschäftsführerin Katja Leveringhaus.

Hotel rented by Explorer Group. No design data available for us.

Source: Photos Herz&Lang, Presse Explorer Hotels

Explorer-Hotel VII Hinterstoder/Oberösterreich 2016



Shell: PH-Principles **like Explorer II Montafon**

Heat/DHW: Biomass district heating
Cooling: Foyer, Reception passive cooling, soil heat pump, active shading
MVHR: Central unit like Explorer II Montafon
Electricity: 100% green electricity

Source: Explorer Hotel

Explorer-Hotel VIII Ötztal, Umhausen/Tirol 2018

Shell: PH-Principles **like Explorer II Montafon**
100% constructed in concrete

Heat/DHW: Biogas condensing boilers 2x75 KW, **new!** CHP for basic heat load
Cooling: Foyer, Reception passive cooling, soil heat pump
MVHR: Central unit like Explorer II Montafon
Electricity: PV 43 KWp, **new!** CHP, 100% green electricity

Unfavorable location for solar energy (thermal, PV)
Reduction of primary energy demand by Combined Heat and Power unit CHP

Source: Explorer Hotel

Explorer Hotels: Overview technical solutions

		1. Producer					2. Producer		3. Producer			Energy Source Heat/DHW	Energy Source Electricity
		Gas	Pellets	District heat	BHKW	heat pump	Solar thermal	Size	PV	Size	Storage	Basis	Basis
Explorer Oberstdorf/Fischen	EXHO	x					x	50 m²	x	93		Biogas	Eco-Power Grid+PV
Explorer Montafon/Gaschurn	EXHM		x				x	80 m²	x	61		Pellets	Eco-Power Grid+PV
Explorer Neuschwanstein/Nesselwang	EXHN	x					x	145 m²	x	157		Biogas	Eco-Power Grid+PV
Explorer Berchtesgaden/Schönau	EXHB			x					x	144	x	Regenerative district heating	Eco-Power Grid+PV
Explorer Kitzbühel/St. Johann	EXHK			x								Regenerative district heating	Eco-Power Grid+PV
Explorer Zillertal/Kaltenbach	EXHZ	x										Natural Gas (fossil)	Eco-Power Grid+PV
Explorer Oberösterreich/Hinterstoder	EXHH			x								Regenerative district heating	Eco-Power Grid+PV
Explorer Ötztal/Umhausen	EXHÖ	x			x				x	43		Biogas	Eco-Power Grid+PV
Explorer Bad Kleinkirchheim	EXHBK			x					x	70		Regenerative district heating	Eco-Power Grid+PV
Explorer Neustift	EXHS					x	x	80m²	x	64		Eco-Power Grid+PV	Eco-Power Grid+PV

08 EXH Ö with BHKW (CHP Combined Heat and Power unit):
Additional regenerative Energy necessary, because of reduced area for solar energy use (location, shading)

Explorer Hotels Group - Masterplan

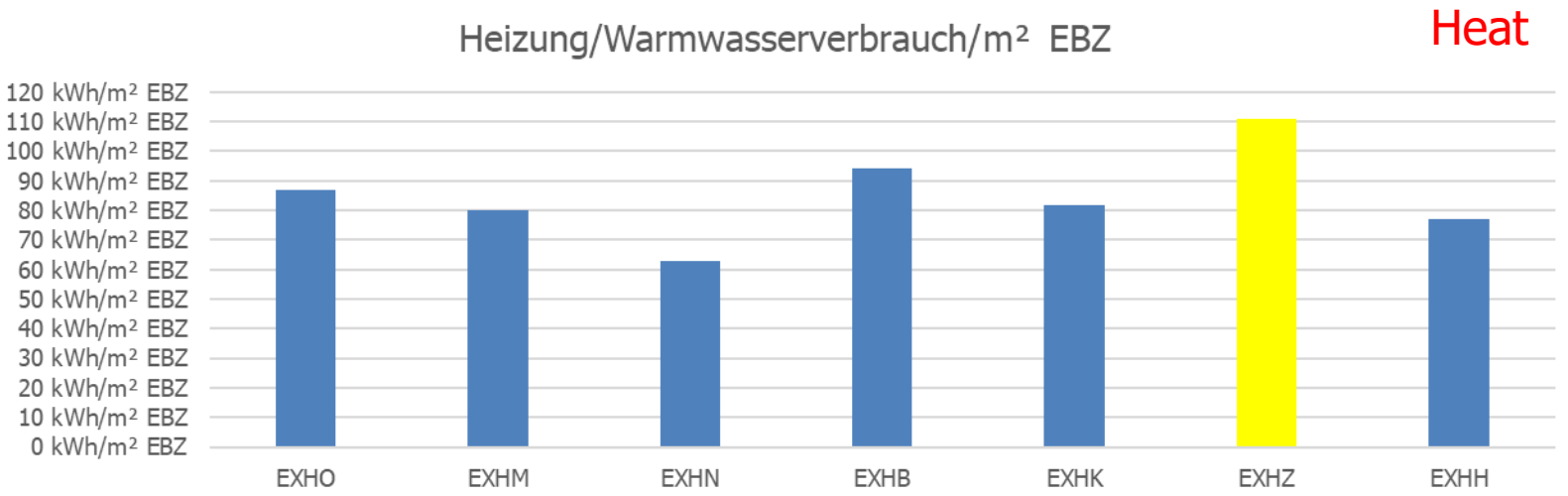
01 Explorer Oberstdorf/Fischen -D	EXH-O	2.522,0 m²	In service 2010-2018
02 Explorer Montafon/Gaschurn -A	EXH-M	3.568,0 m²	
03 Explorer Neuschwanstein/Nesselwang -D	EXH-N	3.568,0 m²	
04 Explorer Berchtesgaden/Schönau -D	EXH-B	3.481,0 m²	
05 Explorer Kitzbühel/St. Johann -A	EXH-K	3.485,0 m²	
06 Explorer Zillertal/Kaltenbach -A	EXH-Z	2.666,0 m²	
07 Explorer Hinterstoder/Oberösterreich -A	EXH-H	3.475,0 m²	
08 Explorer Ötztal/Umhausen -A	EXH-Ö	3.475,0 m²	
09 Explorer Bad Kleinkirchheim/Kärnten I -A	EXH-BK	3.451,2 m²	Design/construction
10 Explorer Stubaital/Neustift -A	EXH-S	2.905,0 m²	

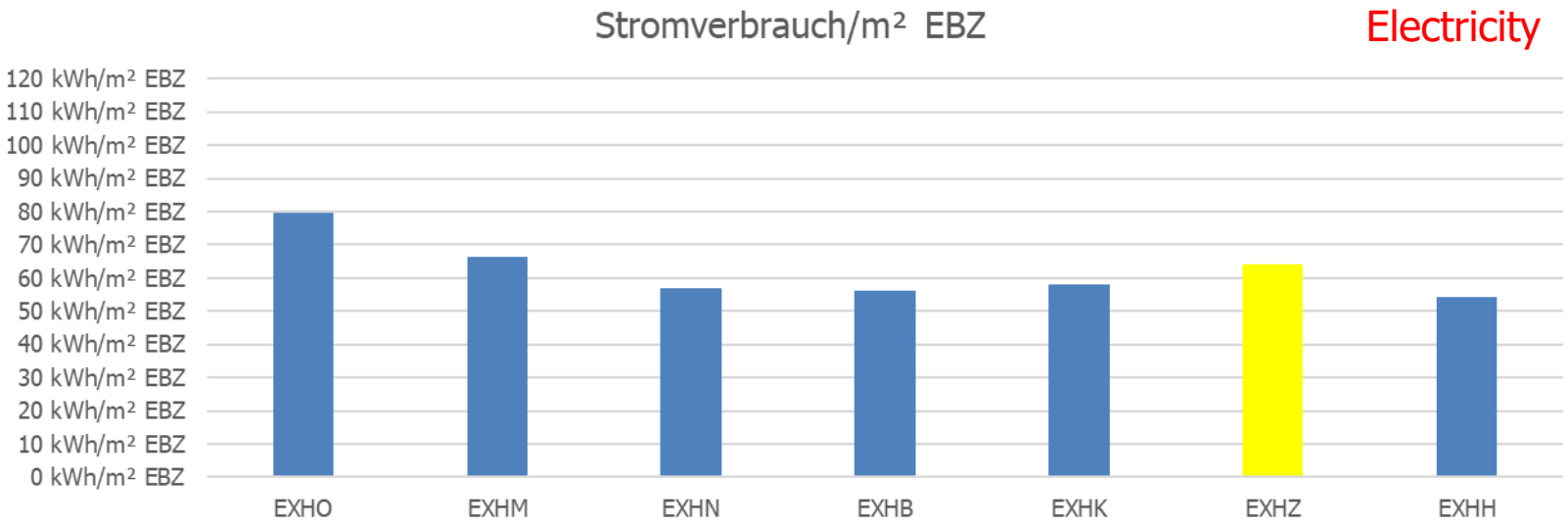
11 – 20 : More Passivhotels in alpine regions with 365 days season

01-07 Explorer Hotels 2010-2017: Monitoring datas of > 1 year in service

06 Explorer Zillertal: The only rented hotel, not designed and built by Explorer Quality Management

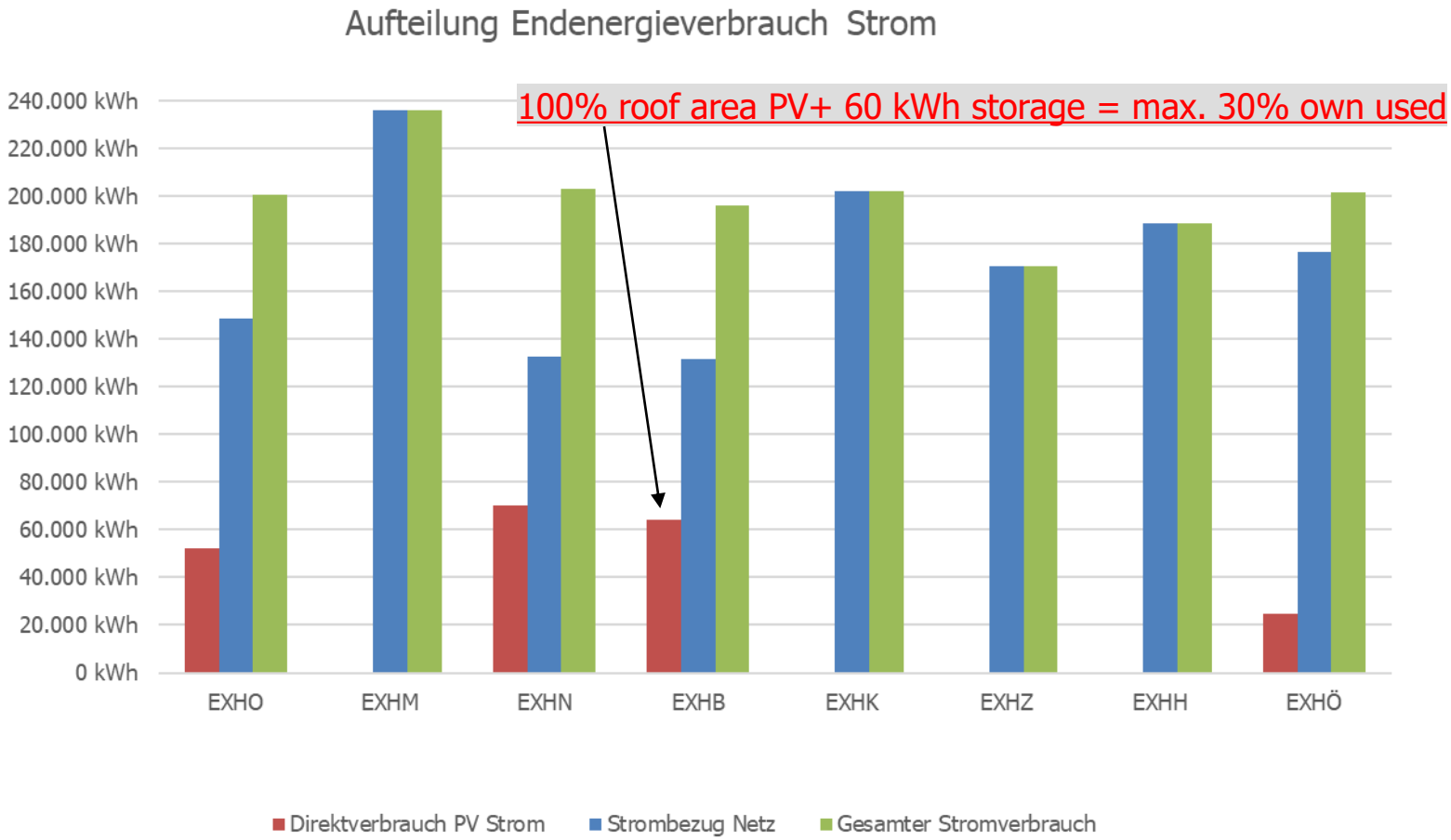
Explorer Hotels Monitoring: Nr.1-7, EE in kWh/m².a





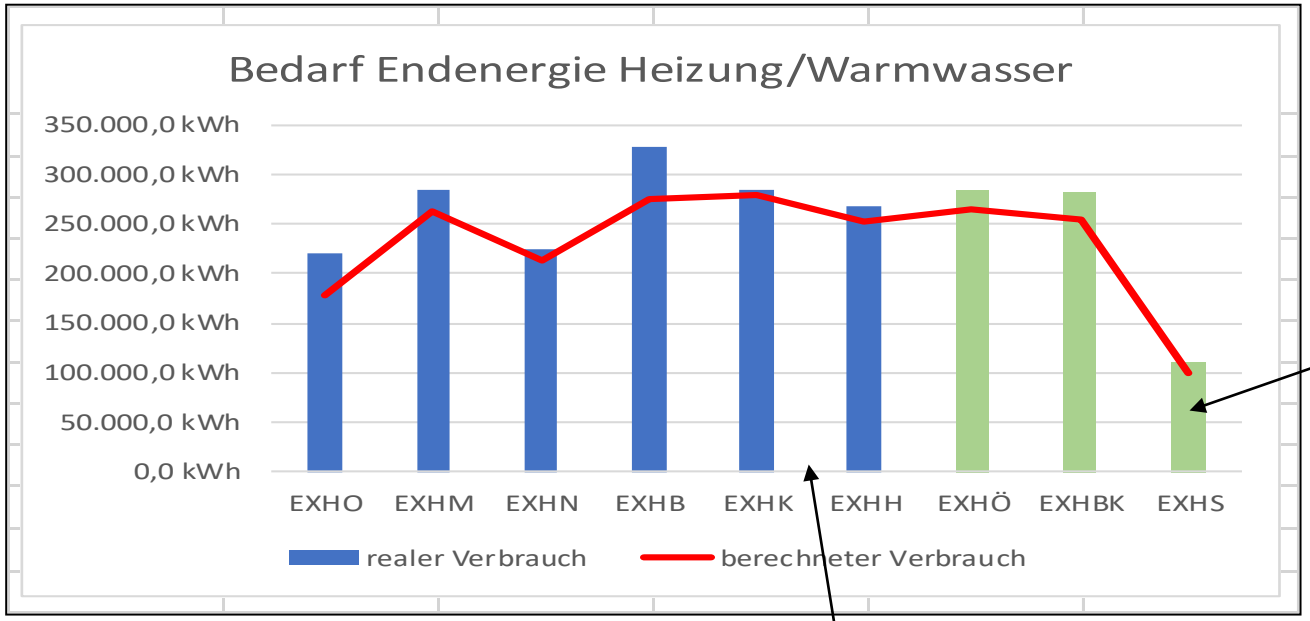
Explorer Hotels Monitoring: Nr.1-8, Electricity kWh/a

Shared consumption electricity



PV own used Grid Summary

Explorer Hotels Monitoring: Heat+DHW in kWh/a



Pilot project:
Heat+DHW soil heat pump
Heat15%/DHW 85%
PV max. equity

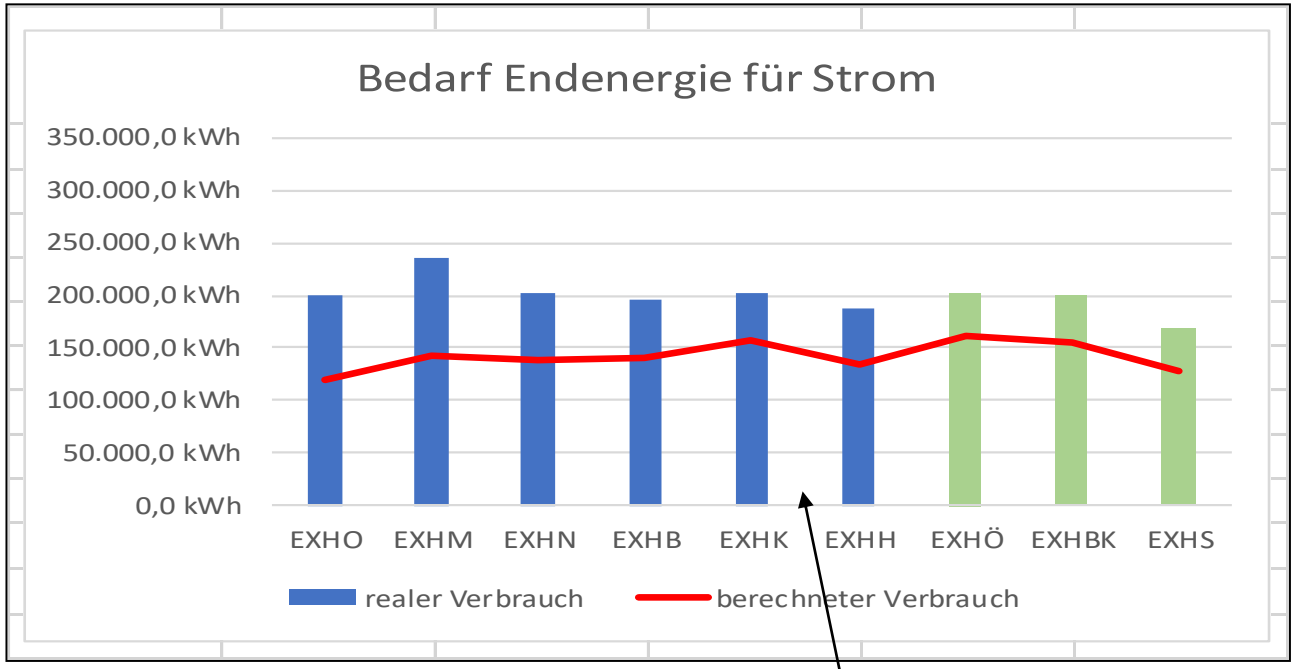
EXH Zillertal missing, PH design not available

Monitoring results, real consumption
Expected results by EXH experience
Calculated in PHPP, according certification criterias

Challenges: Energy for Heating and DHW at present not separatly recorded
Hotels have different load factors and guests (very sporty vs short-term tourists)

Estimation: Heating demand meets PHPP, DHW demand <15% more than PH standard
Share of consumption: Heat 20%, DHW 80% (!)
Additional consumption: load factor or/and very active, sporty guests

Explorer Hotels Monitoring: Nr.1-10 Electricity in kWh/a



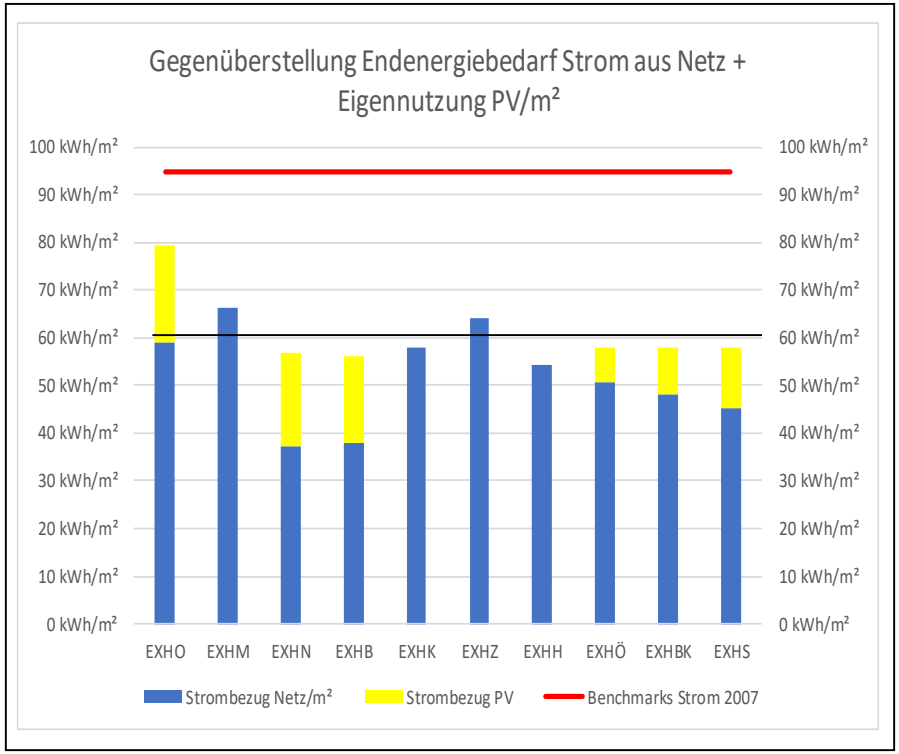
EXH Zillertal missing, PH design not available

Monitoring results, real consumption
Expected results by experience
Calculated in PHPP, PH certification in focus

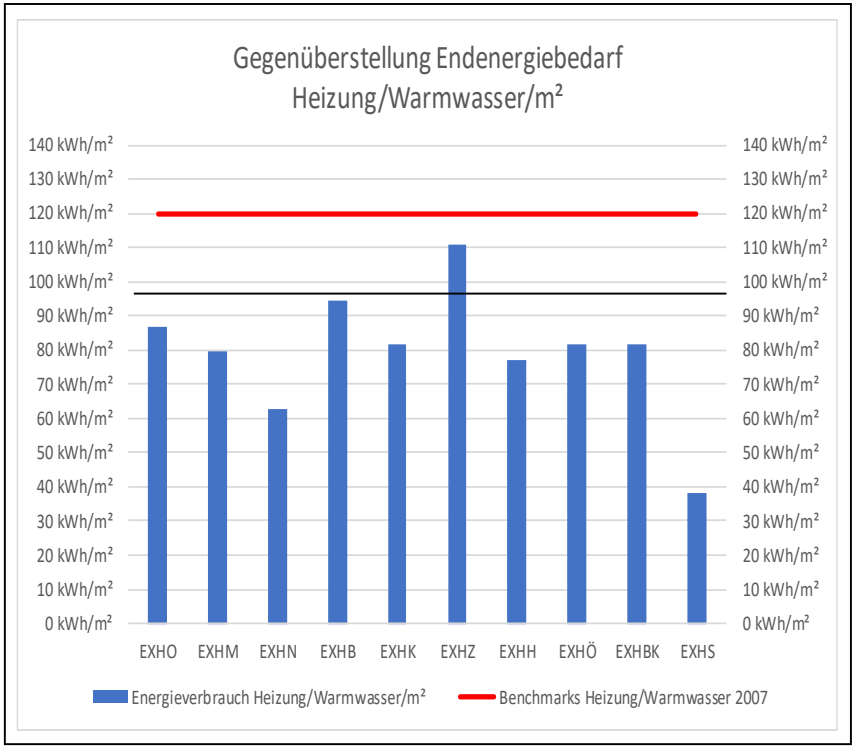
Challenges: The different consumers are not separatly recorded
Different load factors, guests, also constant improvement of technique and design
Estimation: Tendency to <25% more than PH standard

Explorer Hotels Monitoring: Nr.1-10, EE in kWh/m².a

Electricity

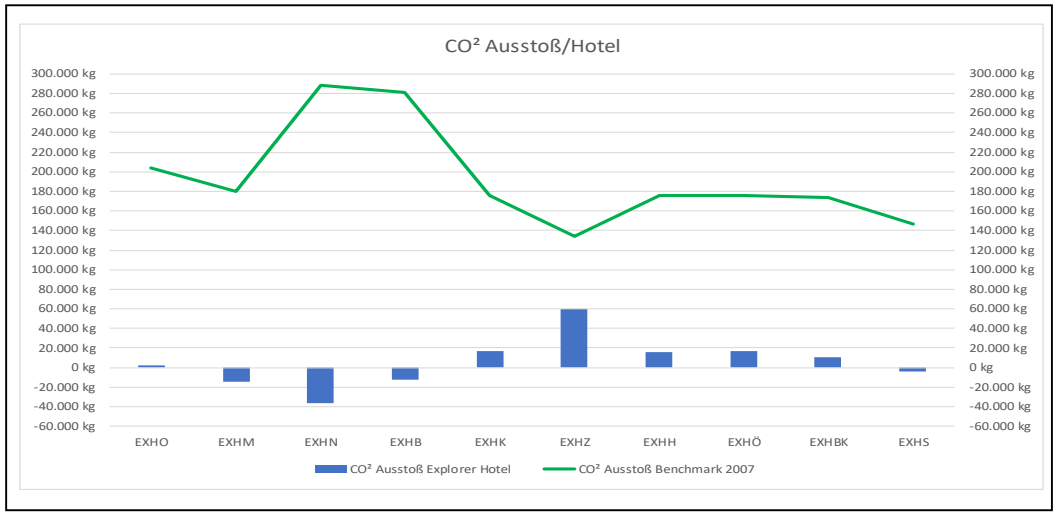


Heat



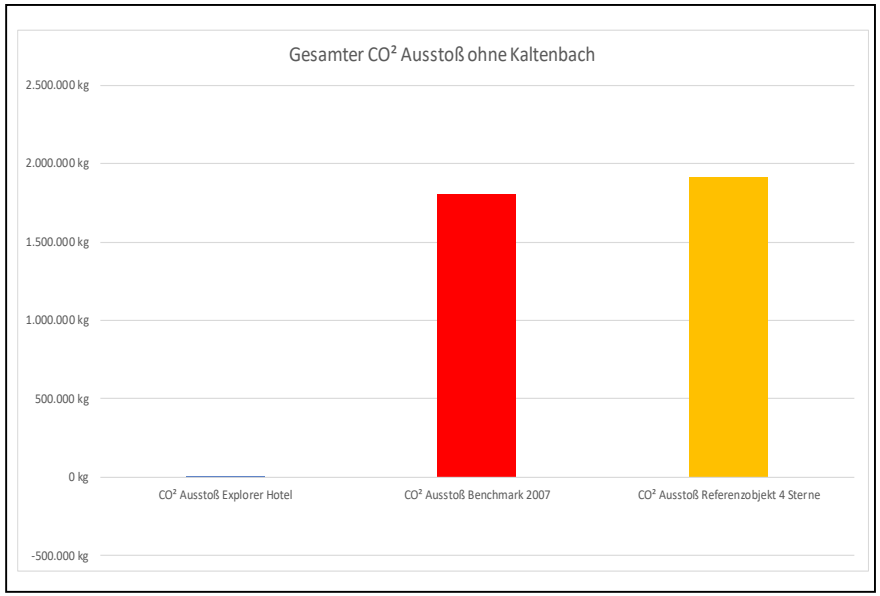
Actual Benchmarks Germany 2015: E≤60 kWh/m².a / H≤95 kWh/m².a
Passivhaus seems to be the German hotels standard – Really ?????????
Monitoring = 100% Reality ! Benchmarks Germany are wishfull thinking !

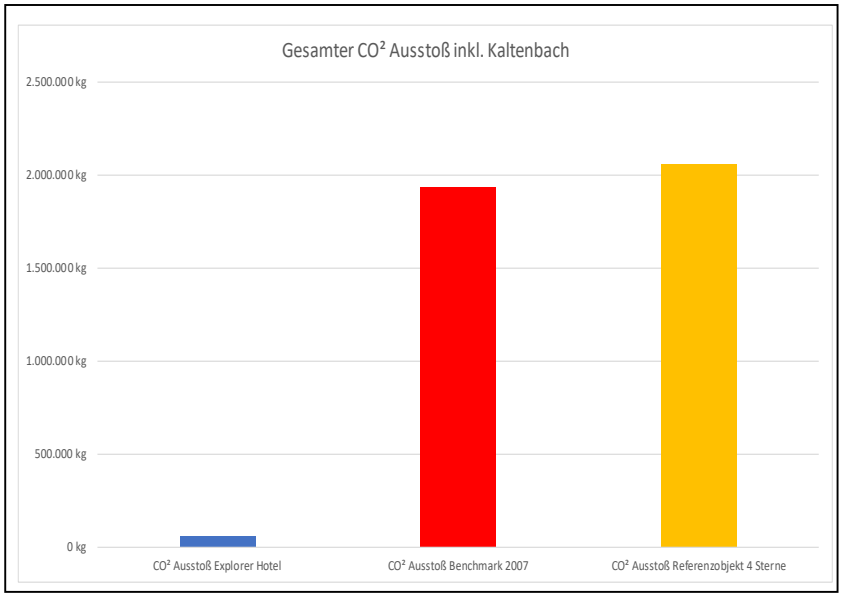
Explorer Hotels Monitoring: Nr.1-10, CO2 in kg/a



NetZeroHotel possible:

- In Passivhaus standard
- 100% regenerative energy
- Energy system is no real problem
- Location is no real problem
- Use is no real problem
- Maximum efficiency and energy production on site ensures economy
- Climate protection repays very fast in cash: image, load factor, less costs





Explorer Hotels Monitoring: Specific hotel datas

Basics for benchmarks:

- Hotels average load factor 70% / all-year operation 365 days
- Heating/DHW and electricity = complete energy consumption

Energy consumption, average of 7 hotels (Heating 12%, DHW 48%, El. 40%)

- **2.500 kWh / bed.year**
- **15 kWh / guest.day**
- **150 kWh / m²TFA.year**
- **7 kWh / bed.day**

Green House Gases / CO2-Emissions (all existing hotels in service)

- **0,15 kg / guest.day**

Guest can neutralise, not using the car for a distance ≥ 1 km/day (foot, bus, train) EASY !!

Explorer Hotels Monitoring: Specific hotel datas

Basics for benchmarks:

- Hotels average load factor 70% / all-year operation 365 days
- Heating/DHW and electricity = complete energy consumption

Energy costs, average of 7 hotels

- **1,0 Euro / m²TFA.month**
- **1,0 Euro / guest.day**

Ressources costs (heat, electricity, water), average of 7 hotels

- **0,75 Euro / bed.day**

POSITIVE: No real price Risks, by increasing energy costs !

Explorer Hotels: A story of success

Certified Passivhotel
Explorer Hotels focus is straight, to build the hotels in Passivhaus standard, with certification.

PH certification is a matter of the hotels quality concept, to be reliable and real sustainable.
Certification costs (<<0,1%) are a matter of the Explorers marketing budget

Facility Management
A Facility manager was installed 2018 to check the NetZeroEmissions, to ensure,
to optimise the existing buildings (Monitoring) and also to influence the new one`s design.

Actually the only existing limit to decrease energy demand much more, is the guests behaviour. Any ideas, experiences ?

Energy Independancy
Use of regenerative energy, production with PV and solar thermics will be increased and optimised, to use as much as possible of their energy directly at the hotels location.

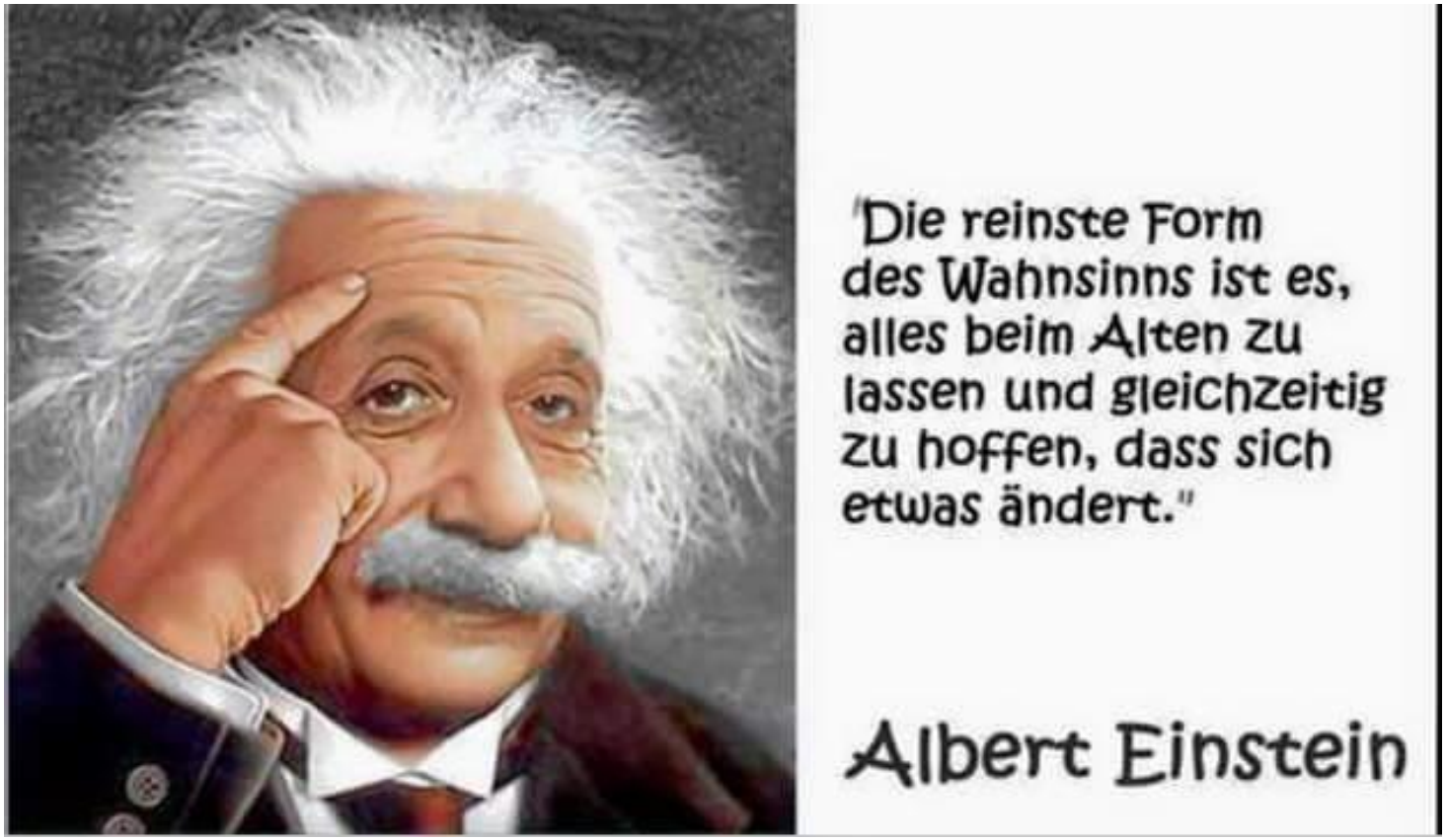
Explorer Hotels: A story of success

Viability (Payback of additional costs)
In 2010 the first Passivhotel had an additional investment of <0,5 Mio Euro and a viability of < 7 years. The viability is still attractive but now <10 years, because of much higher building costs and medium-term low energy prices, despite very low interest rate, good subsidies and consequent standardisation of the buildings concept.

Market Success
Main aspects for guests are the overall performances of the hotel, it`s staff and location, but increasing arguments to use them, are the hotel´s sustainability and PH comfort !

Future
Further Hotels are in construction, design, pre-design, negotiation for land plot and options

Recommendation + multiple benefits
Our international partners and business guests are invited to stay in the local Passivhotels.
POSITIVE: An increasing number of partners have iterating used the hotels for holidays

Our Passivhaus clients are invited to stay some nights in the Explorer Hotels, to have a practical impression how to live in a Passivhaus with comfort ventilation system.
POSITIVE: We save to convince about PH benefits and sense of a ventilation systems.

The purest form of madness is to leave everything in the old and at the same time to hope that something changes