

The development of the Passive House concept worldwide

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National Passive House Conference Bulgaria
December 10th 2009, Sofia

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Passive Houses

- The History
- The Development
- The Future

How, where and when did it all start?

THE HISTORY

History: Low energy buildings



William Shurcliff 1981

Superinsulated and Double Envelope Houses

Amory Lovins 1984

Rocky Mountain Institute



Wolfgang Feist et al 1987

Schrecksbach low energy house

The first Passive House

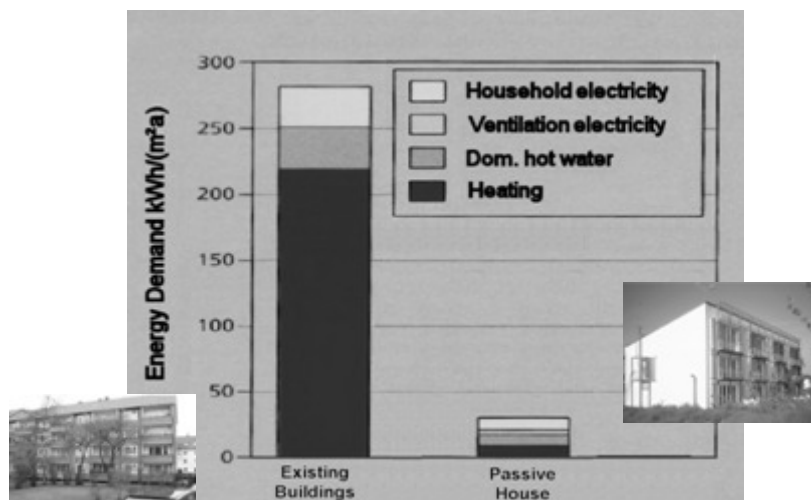
1991
Kranichstein,
Darmstadt



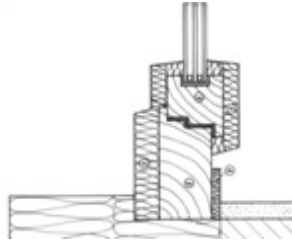
Prof. Bo Adamson; Dr. Wolfgang Feist
Architects: Bott, Ridder, Westermayer

The first Passive House

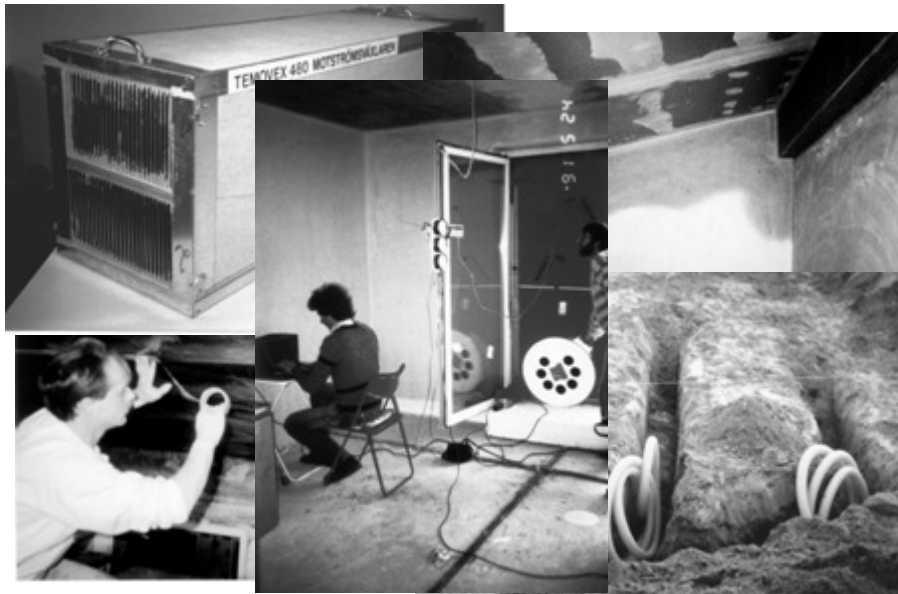
The initial goal: Demonstration

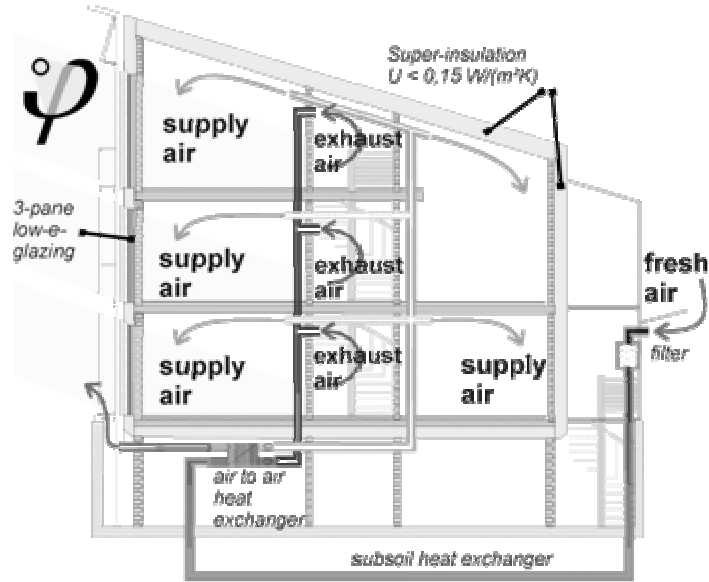


Insulation



Airtightness and Ventilation





DHW and Distribution



Efficient Electricity Use



Washing machines: high efficiency, connected to the hot water piping; 79 kWh/a 80% conservation



daylighting, compact fluorescent bulbs; 107 kWh/a 79% conserv.



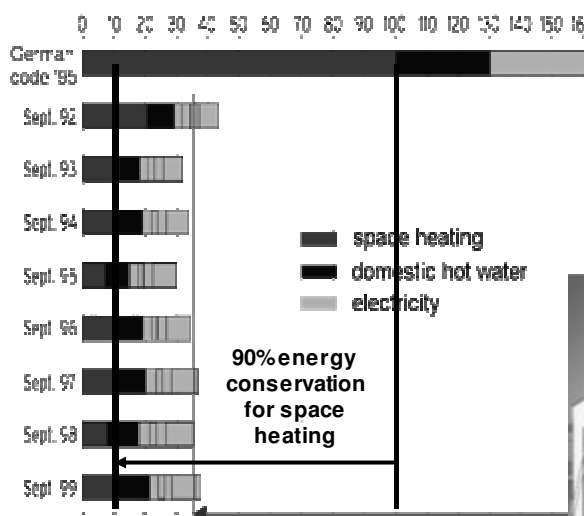
refrigerator: high efficiency, 100 kWh/a 74% conserv.



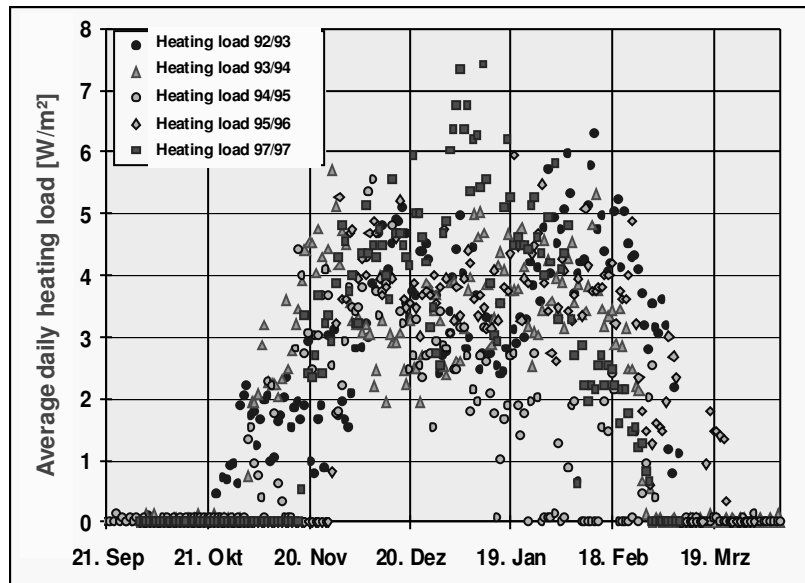
freezer: high efficiency, in the basement; 117 kWh/a 77% conserv.



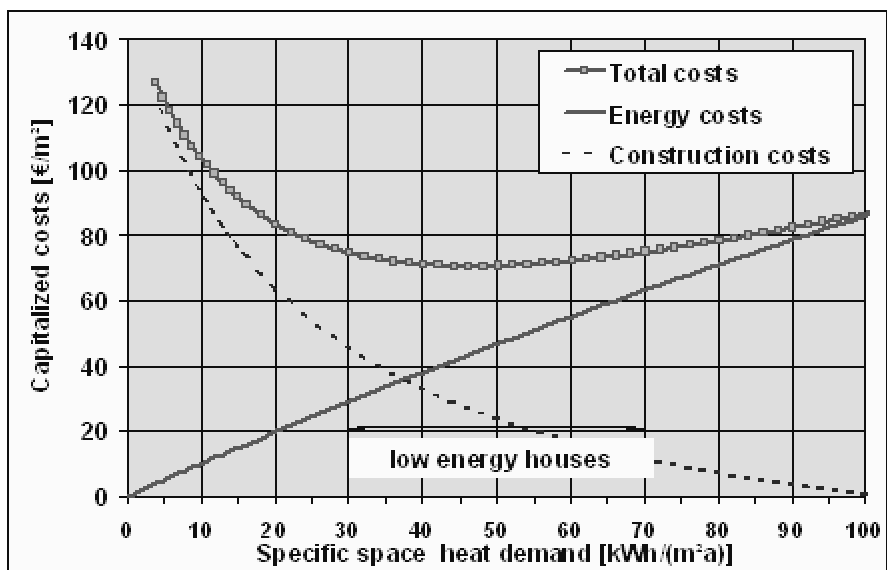
Results



Measured heating load

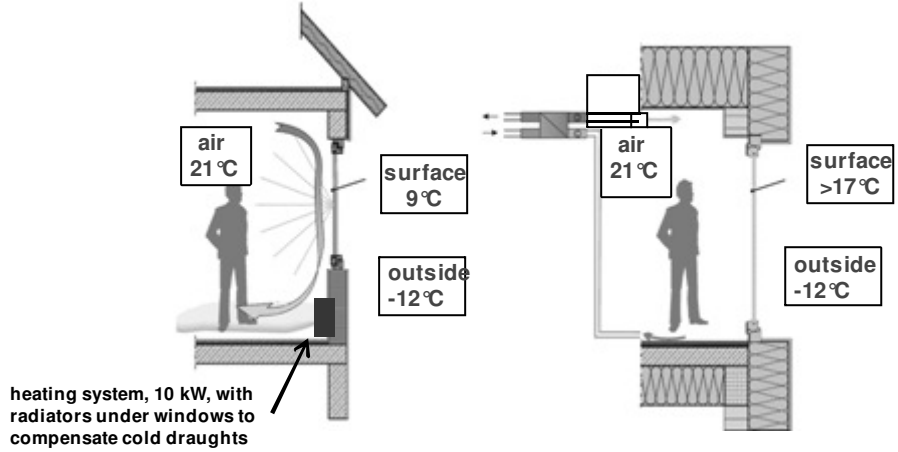


The Problem



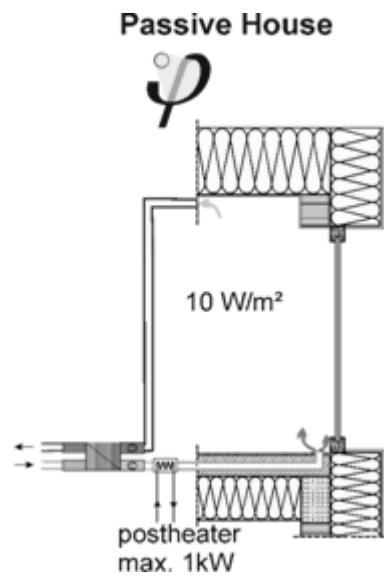
The Approach

Building stock: Passive House:

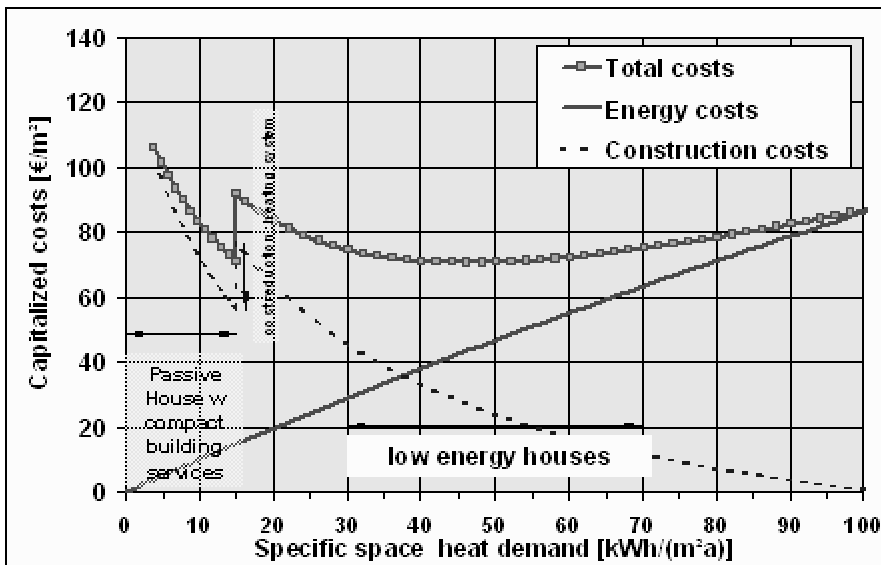


The Approach

Use the IAQ ventilation system for heating and cooling



The Solution



Does the theory really work?

THE DEVELOPMENT

Three Institutions, One Idea



*Passivhaus
Institut
Dr. Wolfgang Feist*

www.passiv.de

- Research and Development
- Literature
- Quality assurance + certification for buildings and building components
- Annual International Passive House Conference



Passivhaus
Dienstleistung GmbH

www.passivhaus-info.de

- Consultancy for architects and house owners
- Quality assurance + certification for planning stage and construction
- Seminars & Workshops

IG PASSIVHAUS



www.ig-passivhaus.de

- Network for information, quality and further education
- Marketing
- Annual Day of the Passive House

Development / achievements

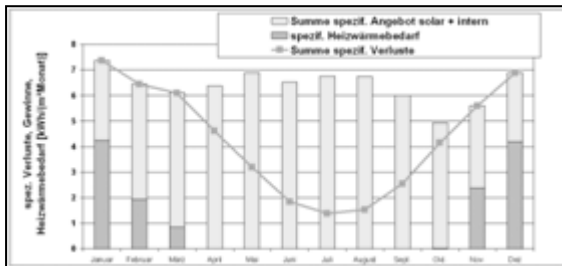


- Continuous development of design tools
- Continuous research and validation / certification
 - Improvement of components
 - Different surroundings:
 - Larger scale e.g. apartment buildings
 - Non-residential buildings
 - Refurbishments
 - Different climates & building traditions
- Consultancy and quality assurance
- Provision of information and training
- Passive Houses as a local standard

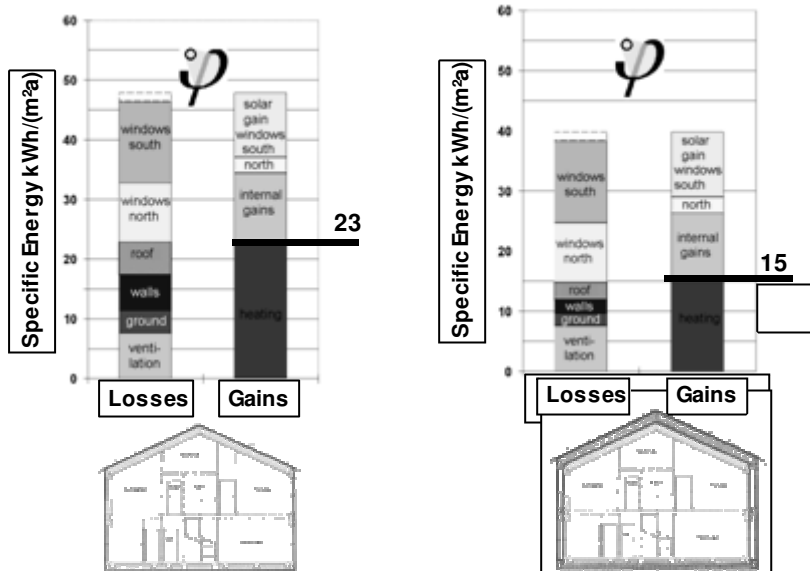
Successful design

Passive House Planning Package (PHPP)

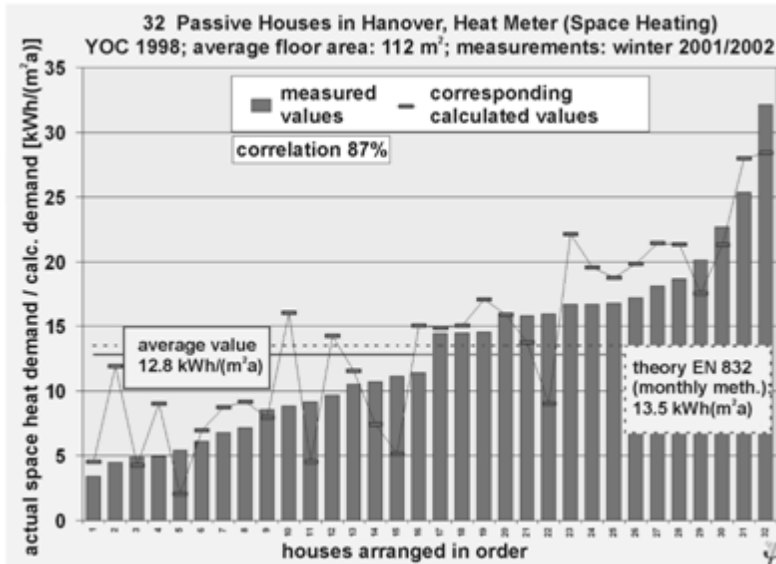
Essential design tool to calculate the energy balance



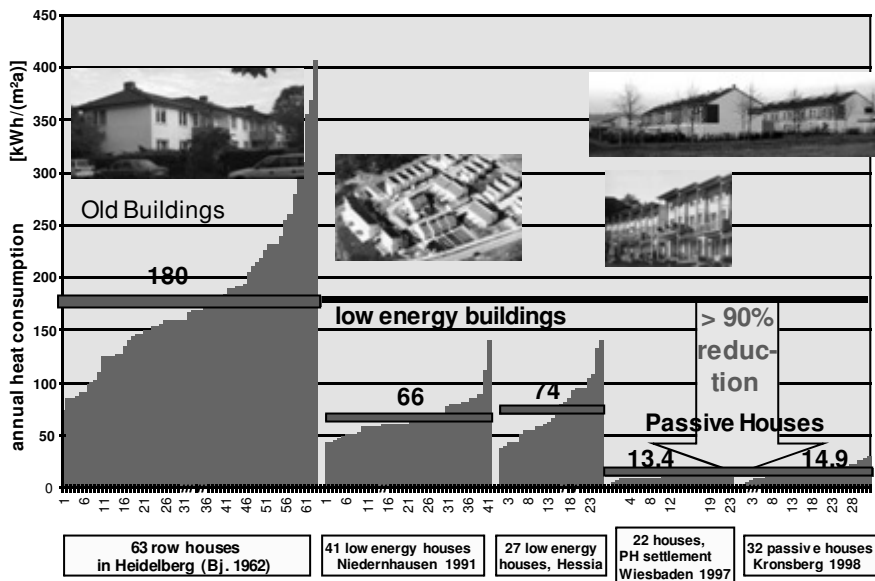
Energy balance with the PHPP



Validation of predicted performance



The residents' influence



Apartment buildings

Wohnen bei St. Jakob



Client: ABG Frankfurt Holding
Architects: P. Grenz, F. Rasch, faktor10, Darmstadt
Foto: Fotostudio Michels, Darmstadt.

Apartment buildings

Lodenareal, Innsbruck

- No. of apartments: 361
- TFA: 28316 m²
- n₅₀: 0.18/h
- Heating demand:
14 kWh/(m²a) (PHPP)



Non-residential Passive Houses

offices

Energion (Ulm)
Architect: Stefan Oehler



Photo: S. Oehler

Lu-teco
Client: GAG Ludwigshafen
Architect: Lutz Laier, Ludwigshafen



Non-residential Passive Houses

schools, kindergartens, gyms, student residences



Riedberg school, Frankfurt

Montessori school, Aufkirchen



Kindergarten, Lindau



Gym, Unterschleißheim

Non-residential Passive Houses



...and many more!

www.passivhausprojekte.de

Factory and exhibition, Zwingenberg



Fire brigade, Heidelberg



Nursing home, Mönchengladbach

Refurbishment



Tevesstraße, Frankfurt am Main

BEFORE
290 kWh/(m²a)

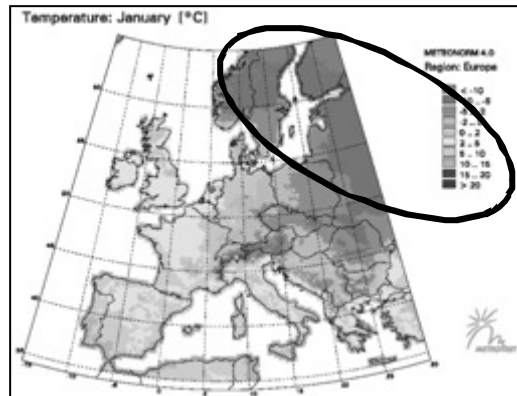
AFTER
17 kWh/(m²a)



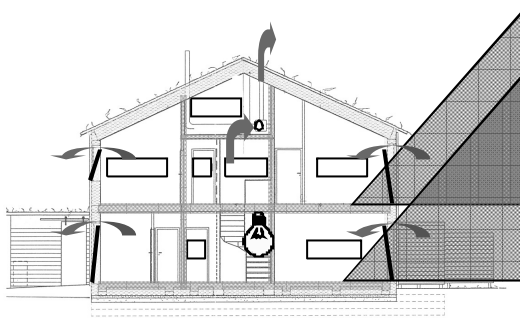
Client: ABG Frankfurt Holding
Architects: P. Grenz, F. Rasch, faktor10, Darmstadt
Financial support: Hessisches Ministerium für Wirtschaft, Verkehr und Landesentwicklung, Wiesbaden

Passive Houses in colder climates

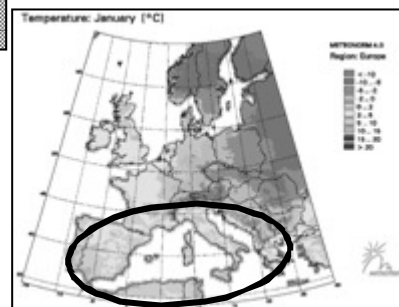
- better insulation of walls, roof, floor
- smaller windows?
- better windows
- higher efficiency heat recovery with efficient frost protection



Passive Houses in hotter climates



- Heat protection
- Solar load
- Internal Gains
- Ventilation
- Thermal mass



Hotter climates: Italy



A.S.S.A Strategy and Results

Strategy

- Conventional Passive House technology
 - U-values 0.12 - 0.22 W/(m²K)
 - Triple glazing & insulated window frames
 - Airtight building envelope
 - Ventilation with heat recovery
- Heating and cooling by conventional multi-split system

Performance

- Nearly no heating consumption
- Required dehumidification is sufficient for cooling

Conclusion



The Passive House Standard is not a
“trademark” but rather an
energy efficient and high quality
building standard
that can be applied by **everybody**,
to most types of use and construction,
almost all over the world!

Passive Houses as a standard?



A very successful example is the city of
Frankfurt where

all new public buildings must be
Passive Houses!

Other communities have similar approaches.

Passive House



German Building Code 2002





More than
13 000 Passive Houses in Germany,
17 500 Passive Houses worldwide!



What next?

THE FUTURE

The Future

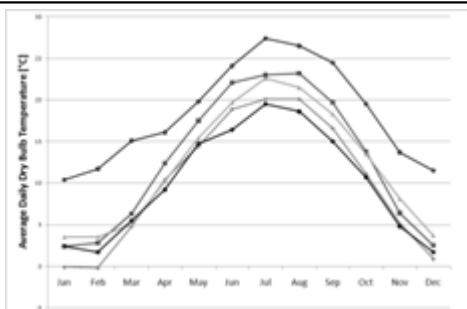
- Information and training
- Further research
- Quality assurance
- Component improvement
- Cost reduction

Continue spreading the idea and knowledge!

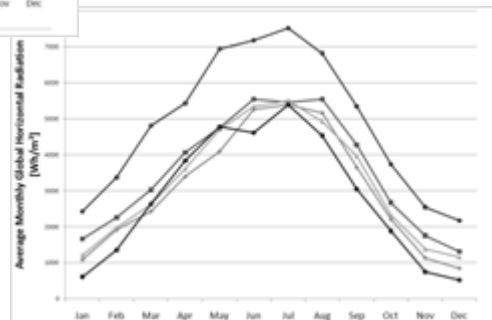
New context?

**Build a pilot project to show that the
concept works!**

Bulgaria



- Location -- SOFIA - BGR
- Location -- PLOVDIV - BGR
- Location -- VARNA - BGR
- Location -- FRANKFURT AM MAIN - DEU
- Location -- SEVILLA - ESP



Climata data: ASHRAE. 2001. *International Weather for Energy Calculations (IWECC Weather Files)*, Atlanta

Passive Houses as a Standard?



The European Parliament (resolution Jan 31st 2008)
“calls on the Commission to propose a binding
requirement that all new buildings needing to be
heated and/or cooled be constructed to
Passive House or equivalent non-residential
standards from 2011 onwards...”

(Action Plan for Energy Efficiency: Realising the Potential)



14^{PH} INTERNATIONAL PASSIVE HOUSE CONFERENCE 2010

International Congress
Center Dresden
2010 May 28th / 29th
with exhibition and
guided tours to
Passive Houses in the
Dresden area.



www.passivhaustagung.de



www.passivehouseconference.org



Thank you for your attention.

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