



Wortmann & Scheerer

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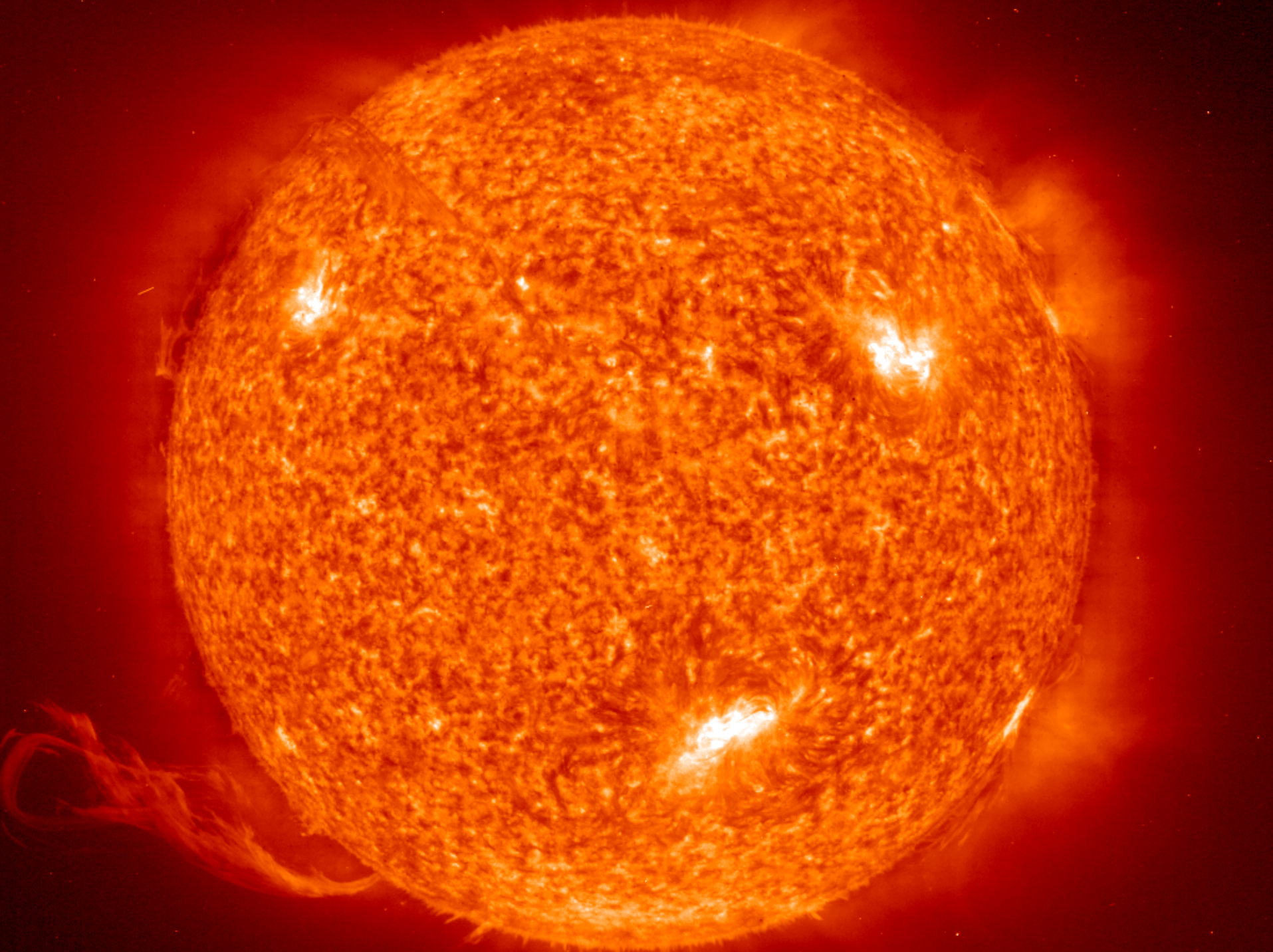








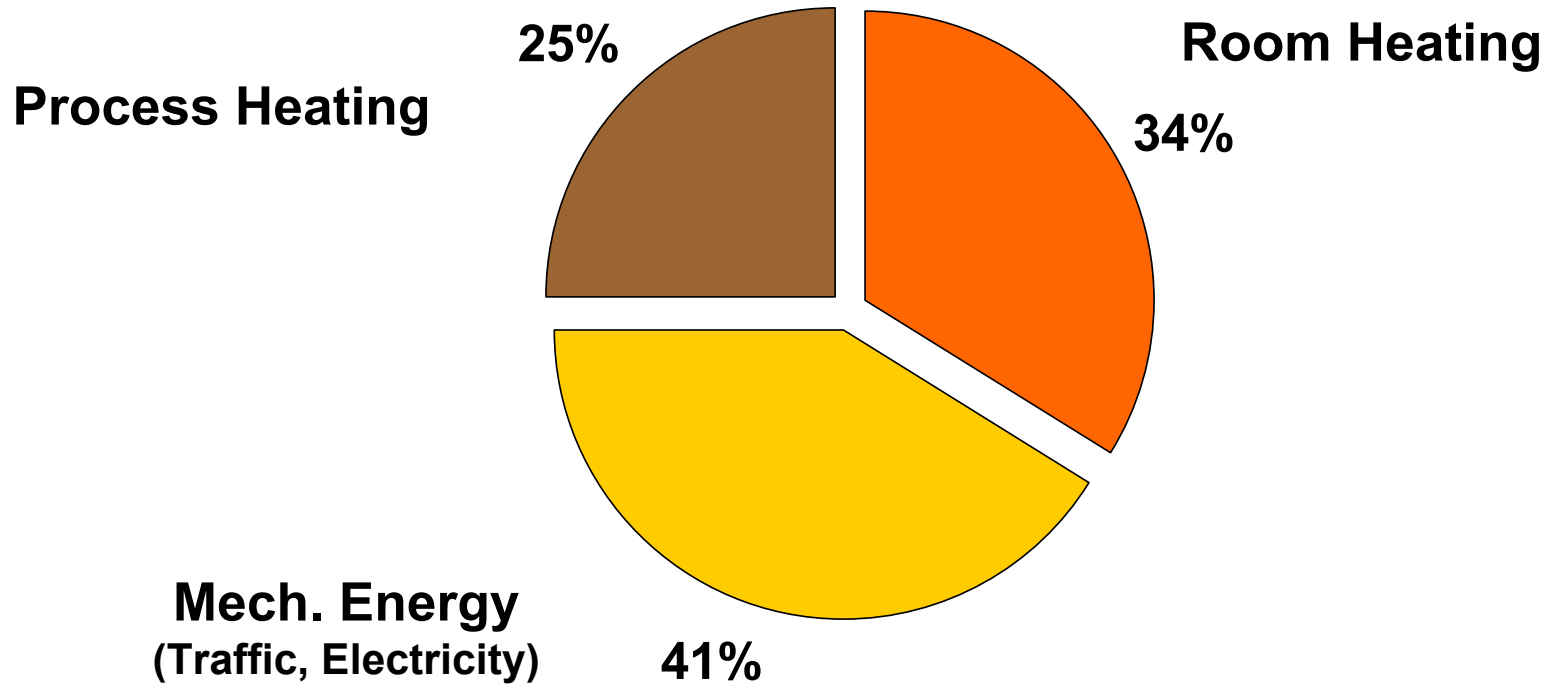




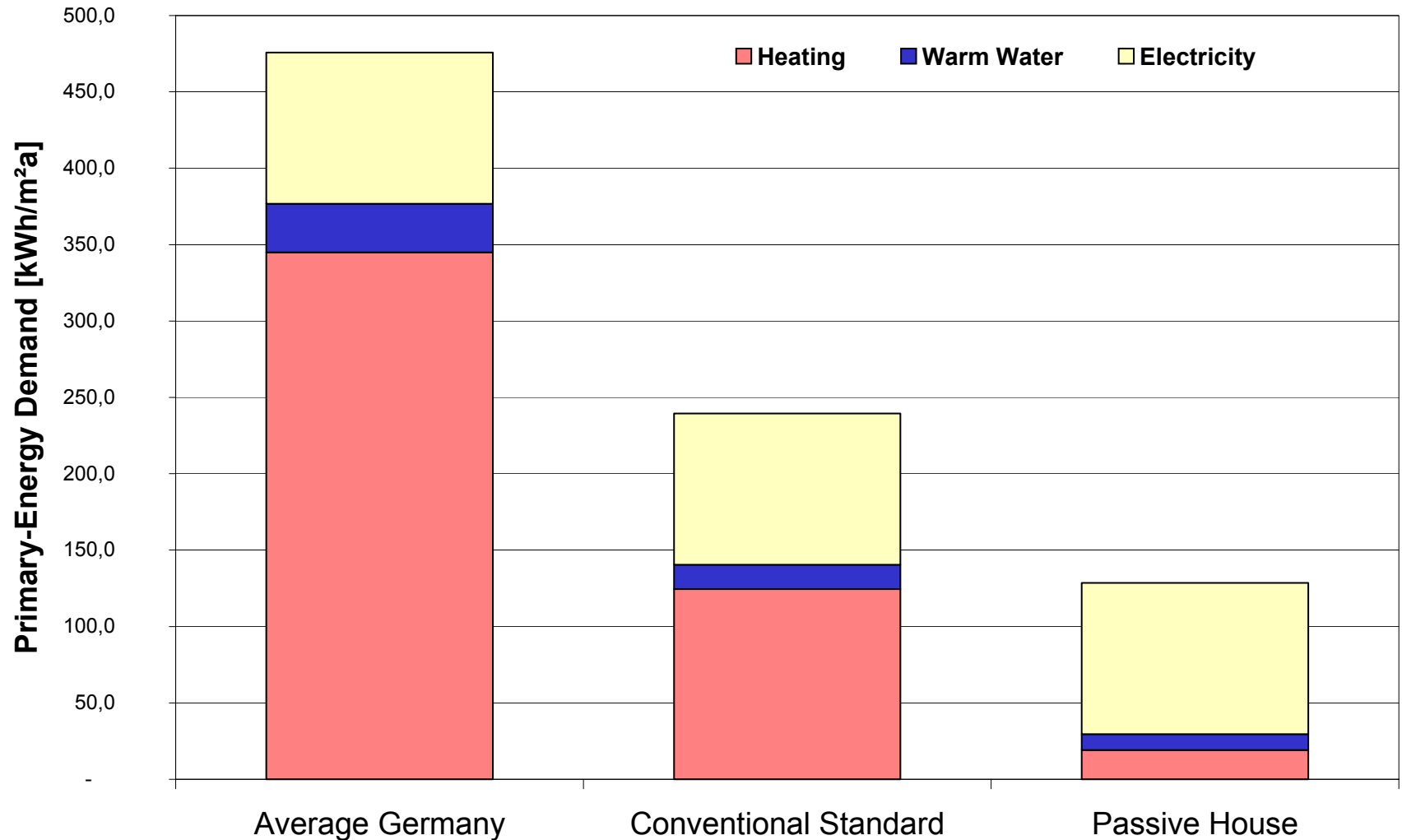




Energy demand in Germany



Energy Demand of different Building Standards



What is a Passive House ?

- Not more than 10 W/m^2 heating power should be needed.

Not more than about 1.600 W heating power for one family house.



= 100 W

- So it is sufficient to use the ventilation plant to heat with fresh air ($160 \text{ m}^3/\text{h} < 55^\circ\text{C}$).

- So the conventional heating is no longer necessary



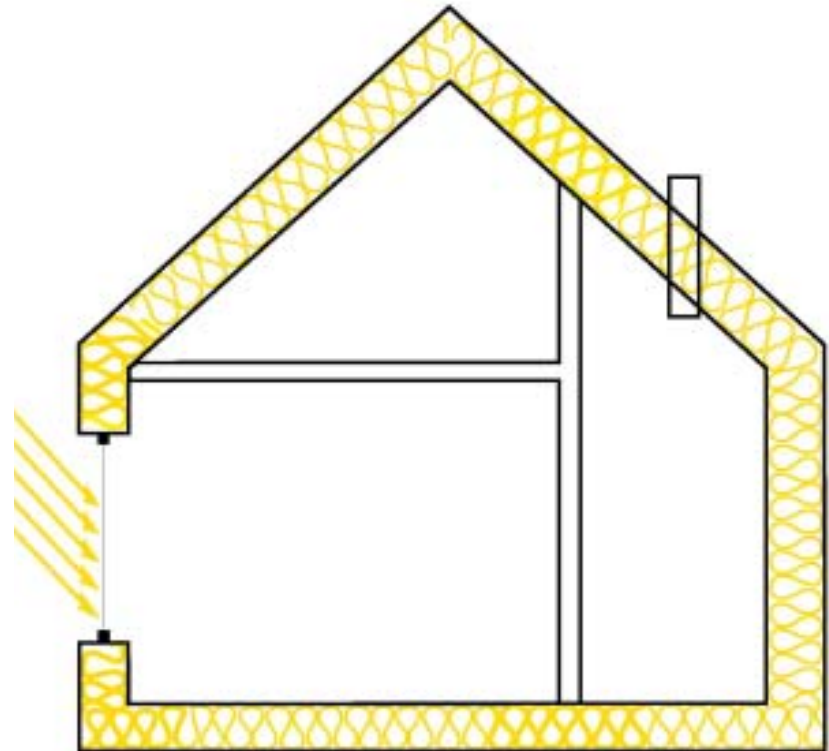
- Not more than $15 \text{ kWh/m}^2\text{a}$ energy demand.

Not more than about 2.000 kWh/a (200 l Oil) for one family house.



How to get that high performance:

- **A Compact Building**
- **Well insulated**
- **No thermal bridges**
- **Tight building envelope**
- **High solar gains of the building itself**
- **High efficient heat recovery for ventilation**
- **Energy saving Household Appliances**



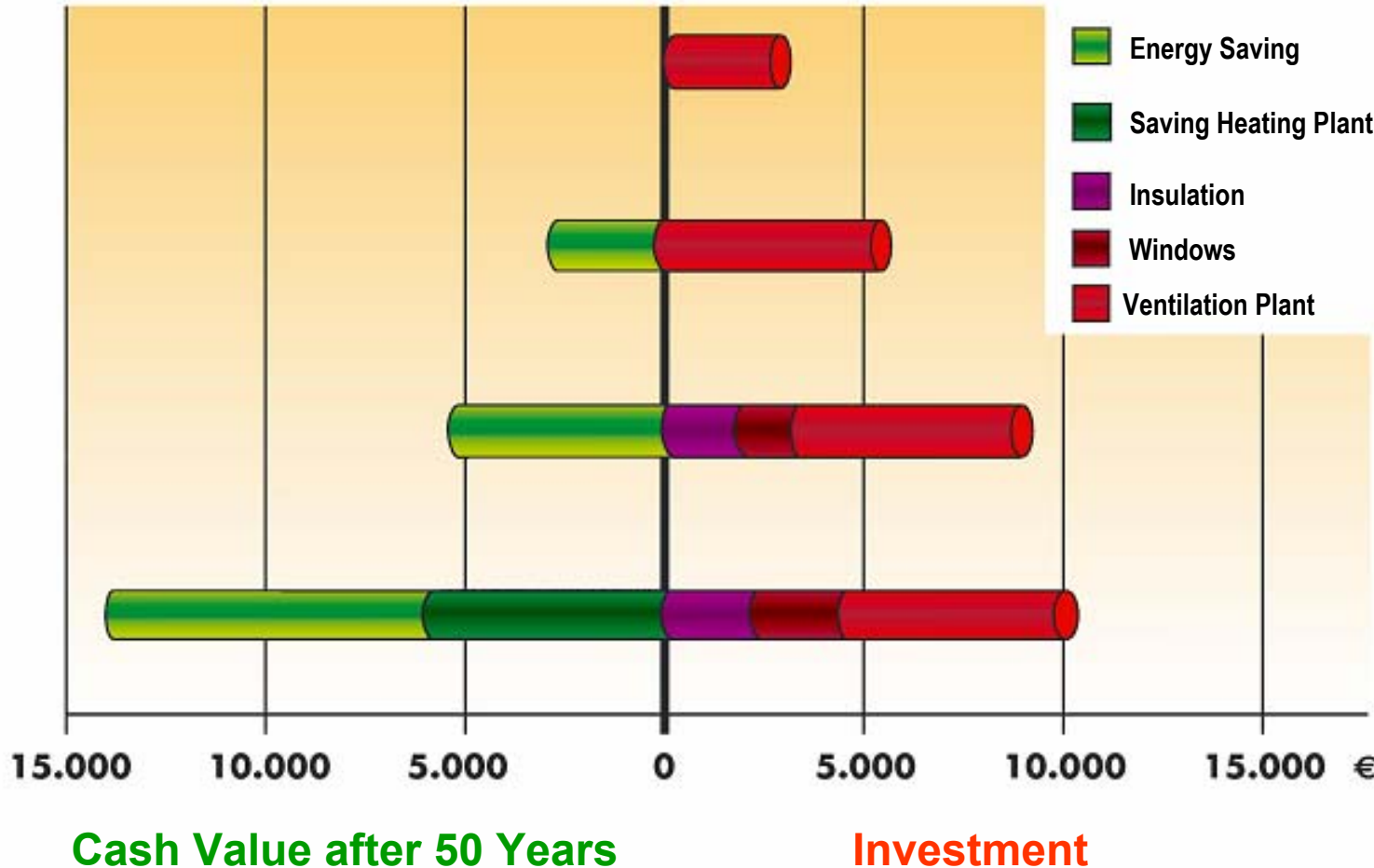
Investment Costs and Savings

70 kWh/m²a
Standard Building

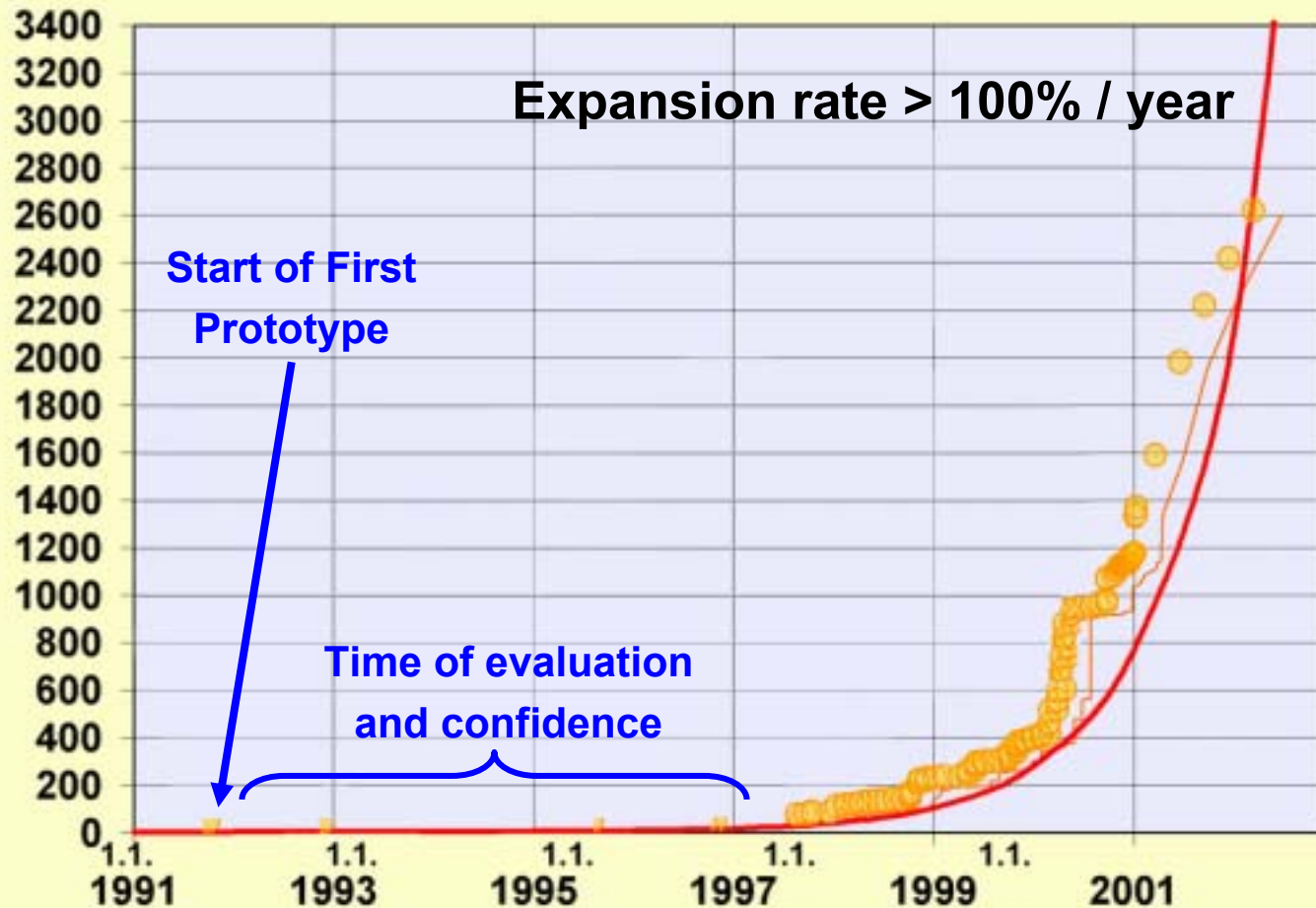
50 kWh/m²a
...+ Ventilation with Heat recovery

30 kWh/m²a
...+ more insulation, better windows etc.

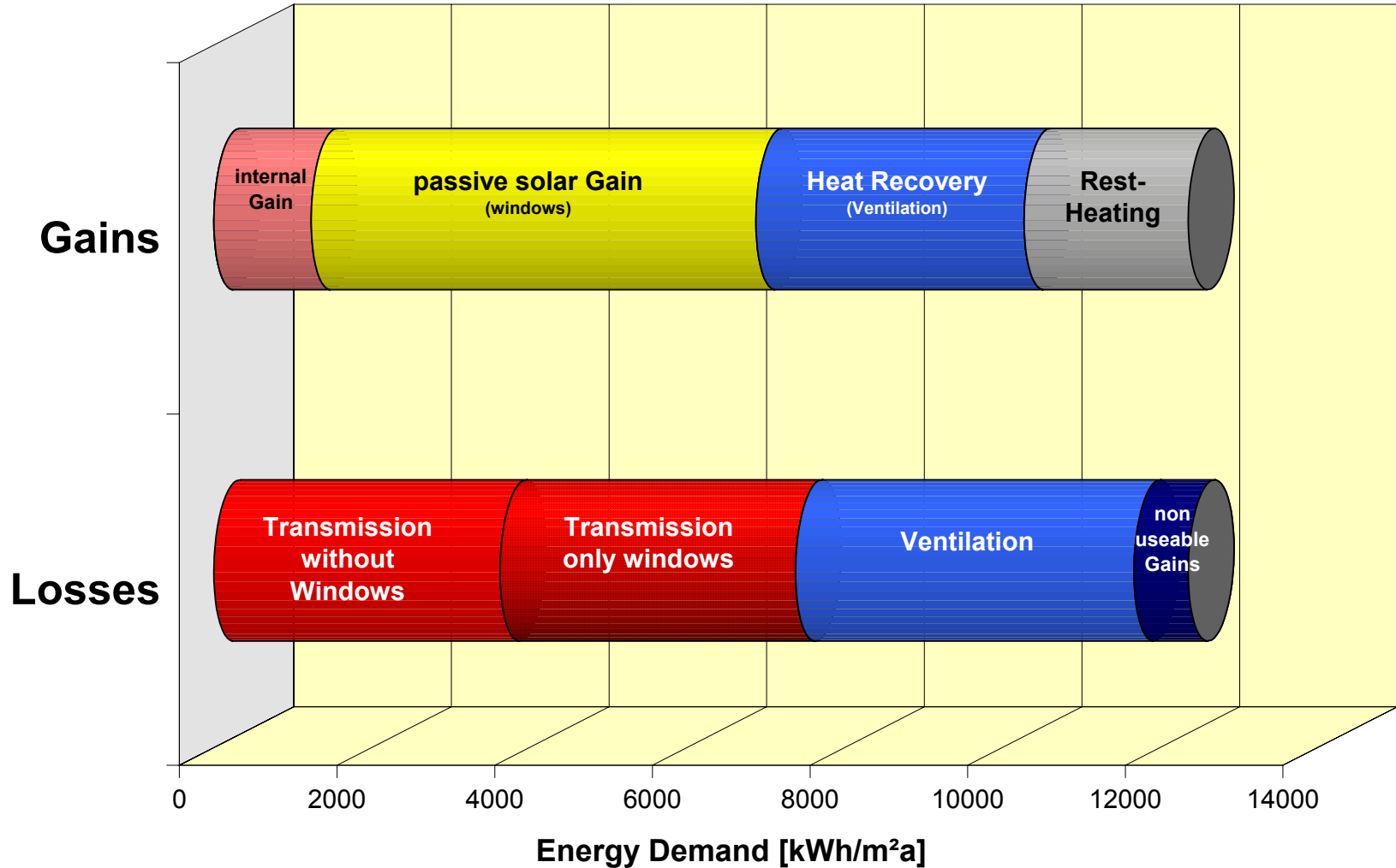
15 kWh/m²a
Passive House



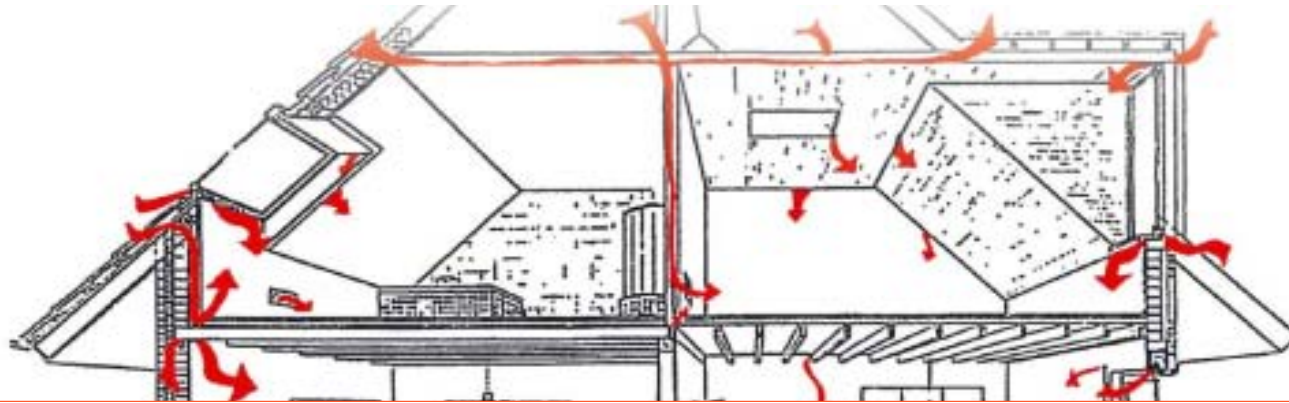
Rate of Expansion of Passive Houses



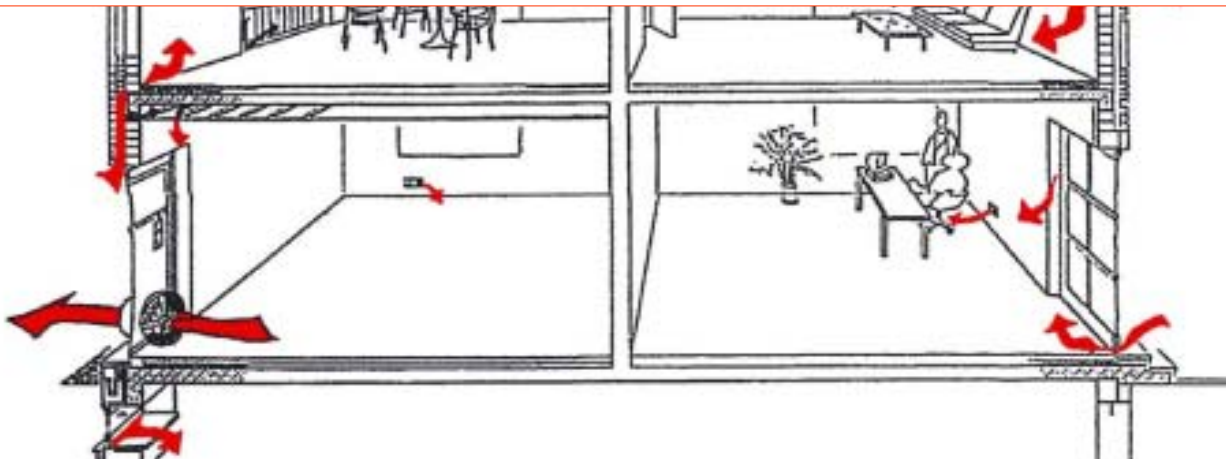
Energy Balance of a Passive House



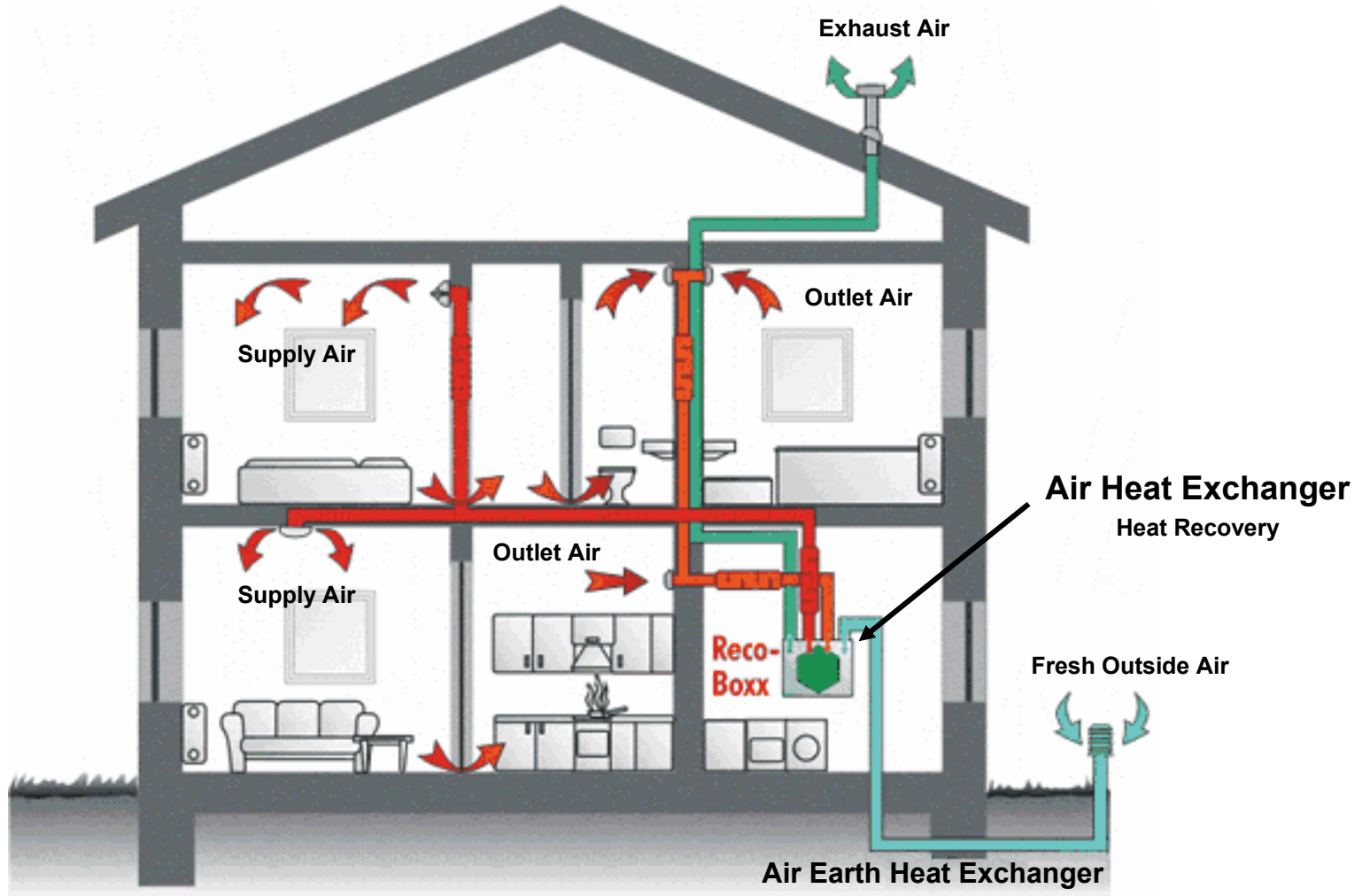
A tight Building Envelope is important



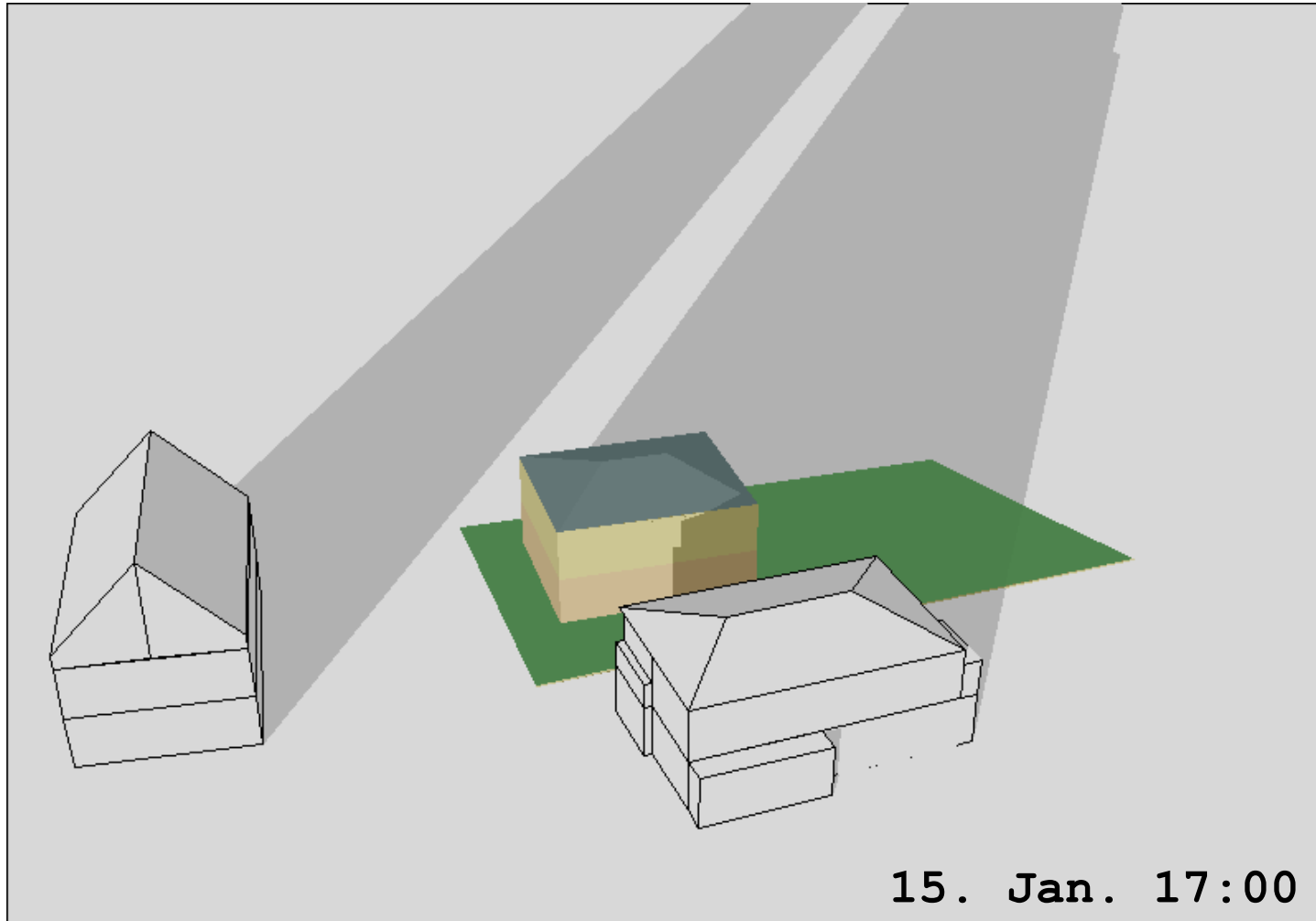
Quality-Management by Blower-Door-Test



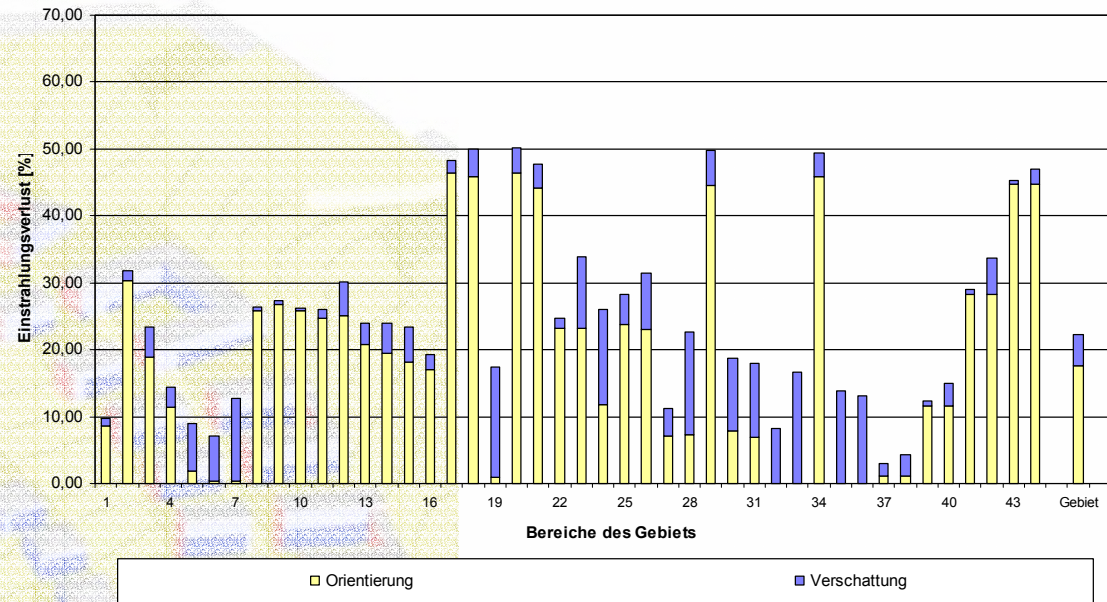
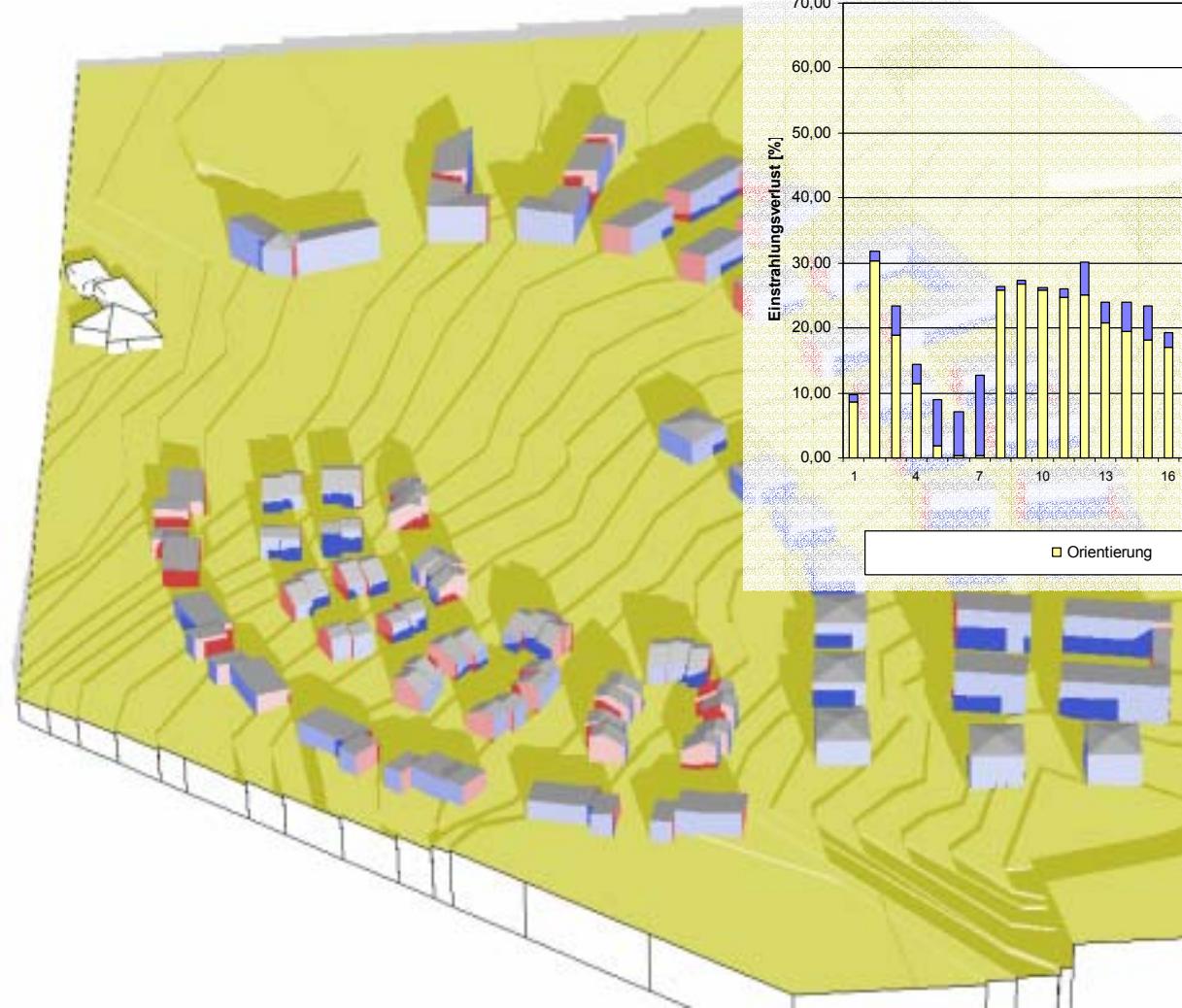
Controlled Ventilation System



Shadowing Simulation to improve Urban planning



Evaluation of urban planning (Example)



First Passive House in Darmstadt, Germany 1992



Passive Houses as Non-Residential Buildings (Examples)



Student-Hotel, GH-Uni, Hagen

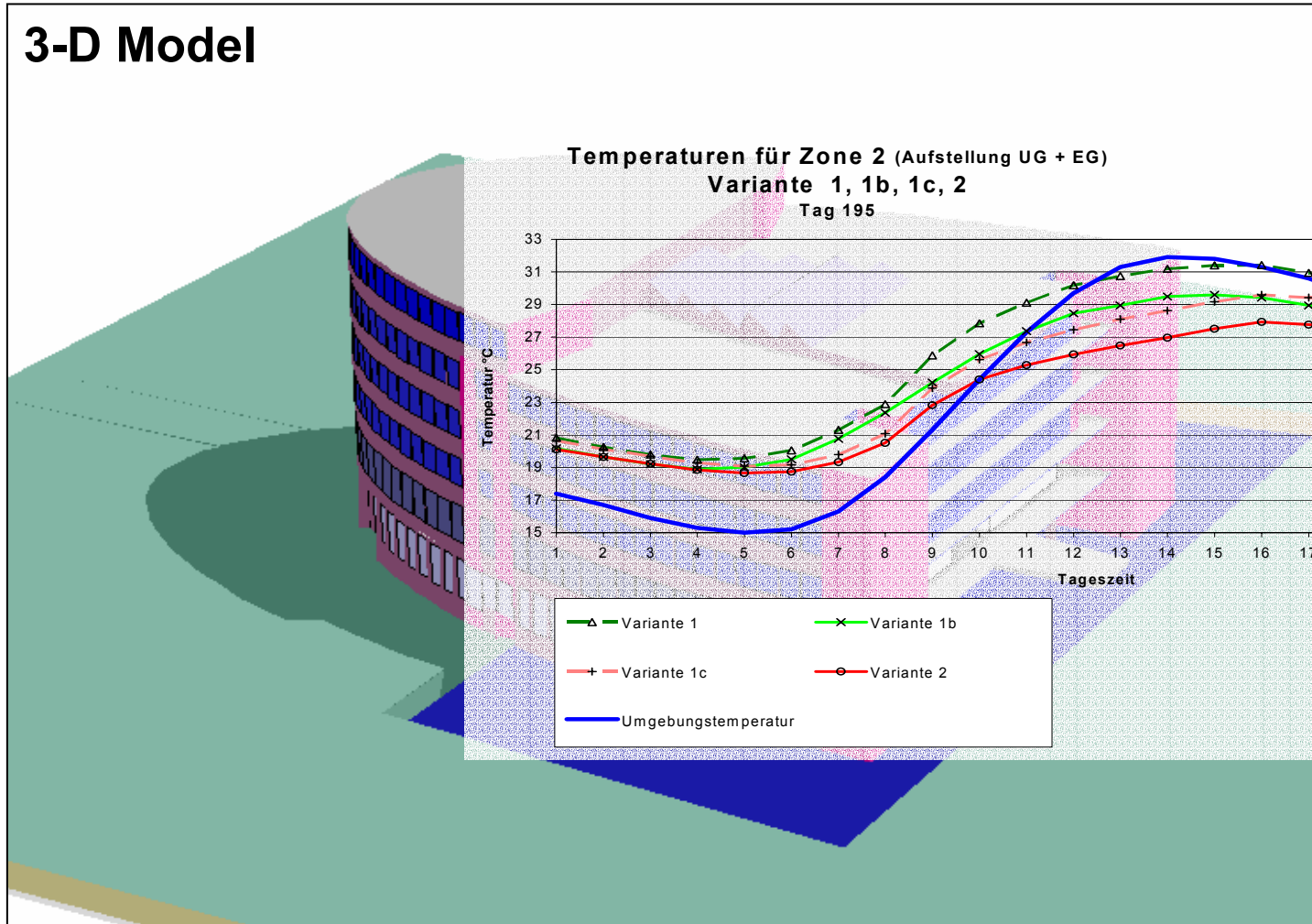


Production-Hall Hübner, Kassel-Waldau

Office Building Energon, Ulm

Computer Simulations - an excellent tool for technical design

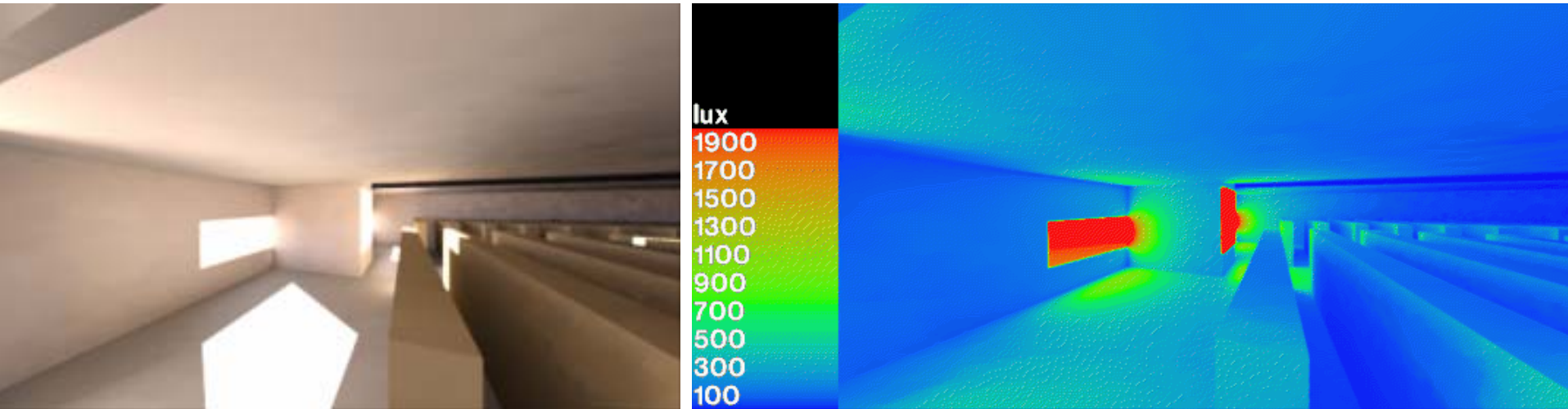
3-D Model



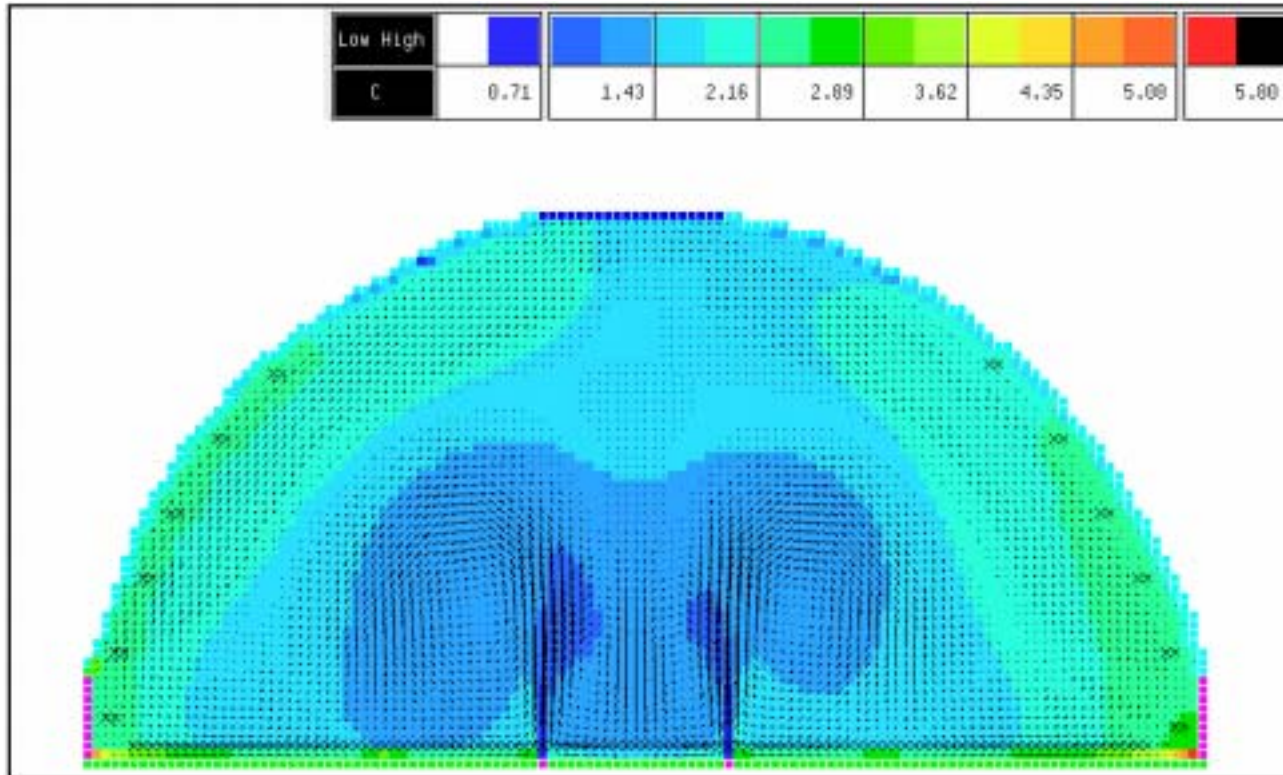
Thermal Simulation

Computer Simulations - an excellent tool for technical design

Daylight Simulation



Computer Simulations - an excellent tool for technical design



Simulation of Air Movements

What happened in the last years in Germany and Austria

- **Development of hundreds of new products:**
most are by small and medium-sized businesses
 - triple glazing
 - Well insulated window frames
 - Heat Recovery Systems
 - Compact Devices for Ventilation, Warmwater and Heating
- **State-aided Programs (50 Solar Cities in NRW, Germany)**
- **Education in Universities and other Organisations (Energy agency)**
- **Quality Management (test of new products, evaluation)**

How to start a Program for Passive Houses in other parts of the World?



- **Support to accompany the first steps**
- **Adapted Passive House concept for the considered climate region**
- **Adapted products for the local Passive House concept**
- **Marketing to introduce people to the new concept**
- **Training of architects, engineers and craftsmen in the new concept**



Thank you
very much