Energy Efficiency in buildings

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Outline

- **Background**
- **RD&D program “Building of Tomorrow”**
- **Dissemination program “klima:aktiv”**
- **Lessons learned**
  - From Austria
  - From Europe
- **Back to Future – Building of Tomorrow PLUS**

Energy efficiency in buildings – background

high priority – high potential

- **Energy efficiency is of highest priority in the energy strategy**
  - Special focus on buildings
  - Key stakeholders in Austria: Federal States (Länder)
- **Various barriers for energy efficiency in buildings**
  - Public awareness (improved by building certificate)
  - Higher investment costs for efficient buildings (esp. renovation)
  - Limited acceptance of new technologies by industry and costumer
- **Substantial improvement of energy efficiency in buildings over the last decades**

Energy efficiency in buildings – R&D

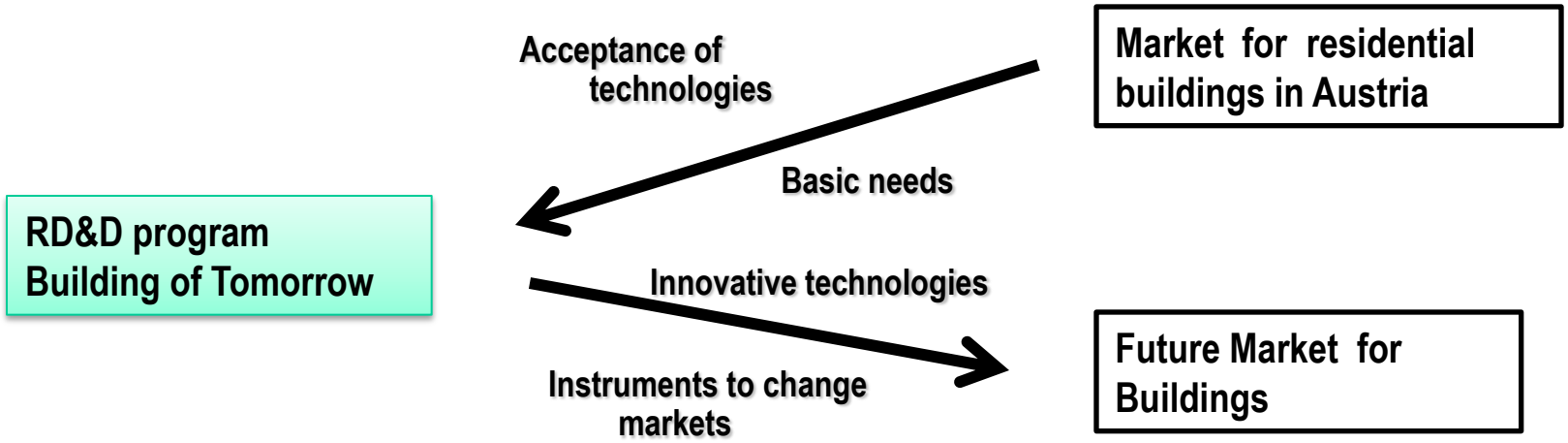
- Fragmented industry; mostly SME; lack of innovation
- Energy demand is not a main driver in building R&D
- Very limited international competition in building industry
- Few countries run R&D programs for building technologies
- Ongoing R&D focuses on incremental improvements
- Efficiency gains did not result in reduction of energy demand for heating and hot water

RD&D program „Building of Tomorrow“

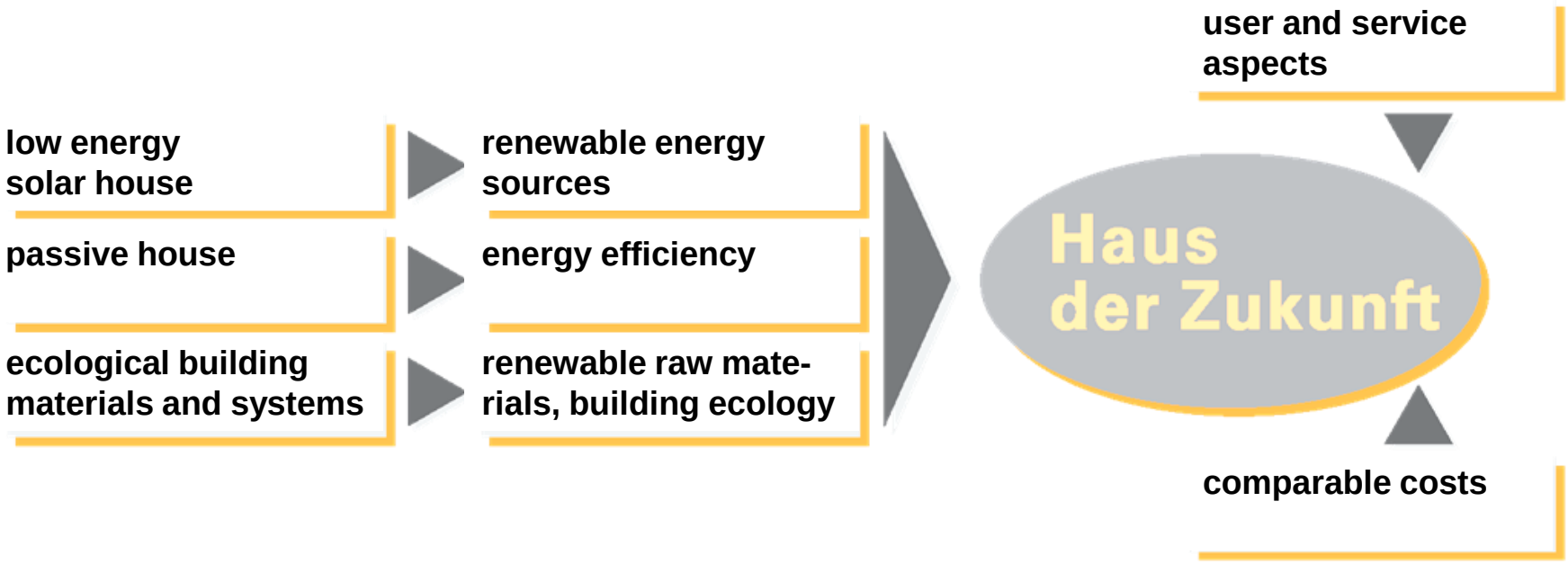
Building of Tomorrow – a target-oriented RD&D program

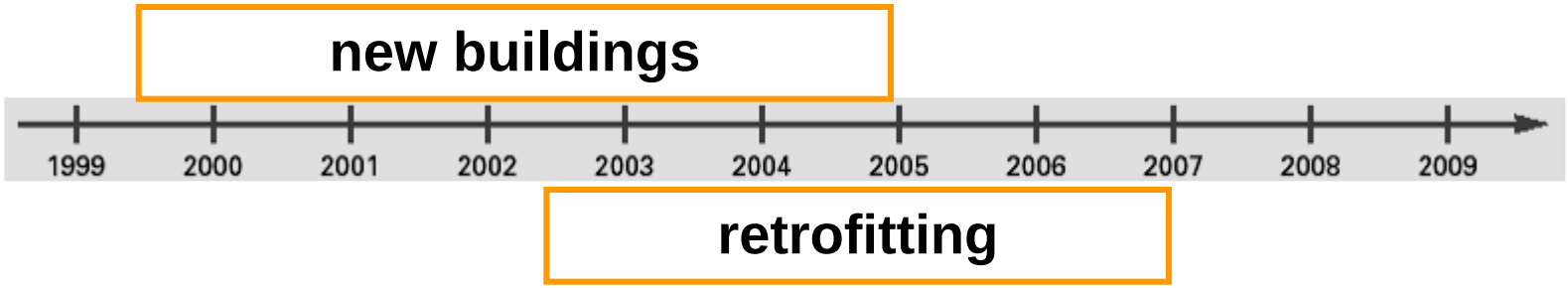
What was the final target?

Substantial increase in sustainable buildings in Austria



Building of Tomorrow – a definition





Best practice “Building of Tomorrow”

a definition

An innovative residential or other (office, commercial) building

- **which – compared to the present practice in Austria – reduces energy and material consumption considerably**
- **which increasingly uses renewable sources of energy, renewable and ecologically sound materials**
- **which also takes into account social aspects and cost efficiency**
- **with a high market potential**

The program is a target driven top-down program covering basic research, applied research and demonstration projects; competitive mechanism to secure quality of R&D (calls) have been used

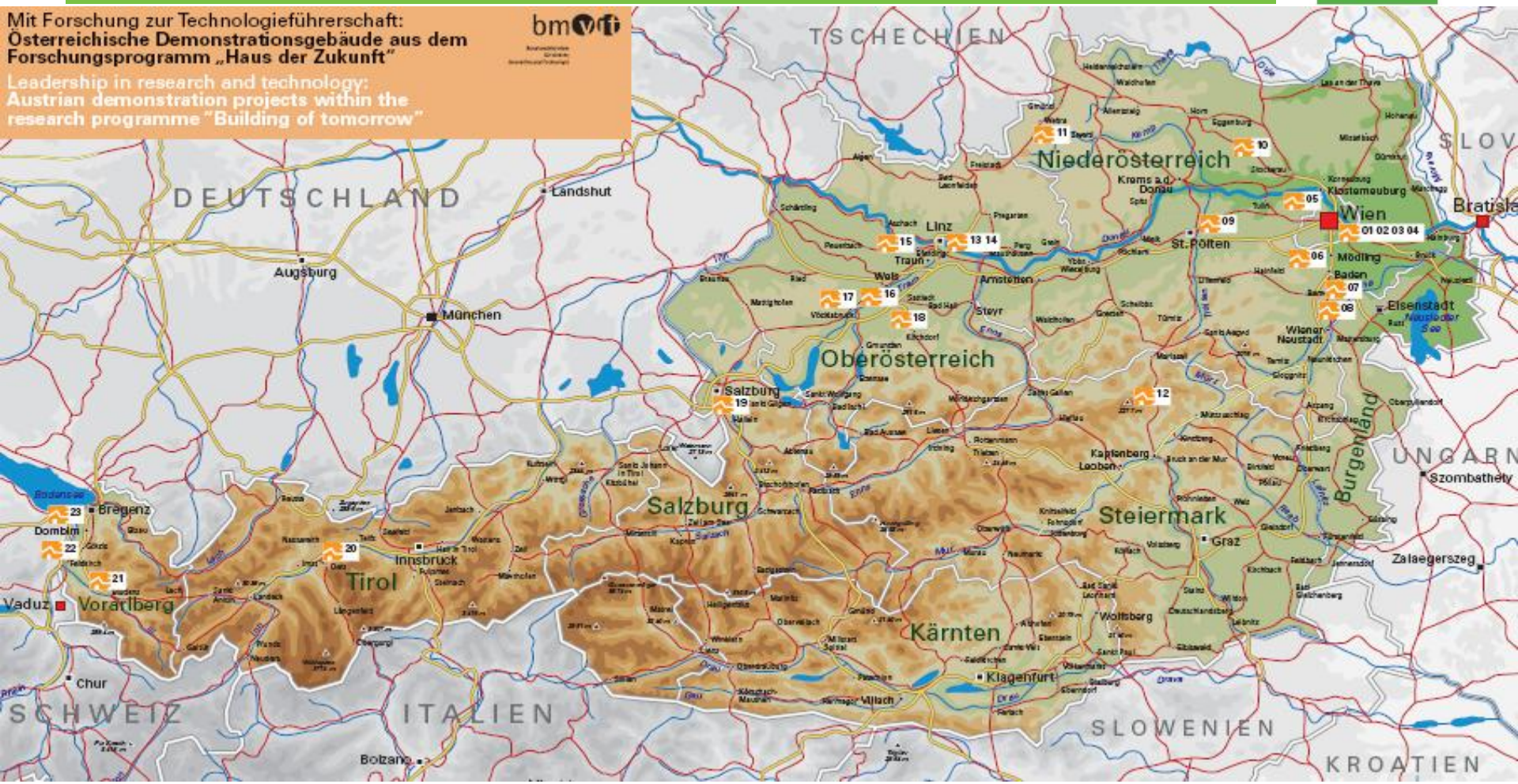
Best practice “Building of Tomorrow”

Main characteristic

- Program owner: Ministry for Transport, Innovation and Technology – Department Energy and Environment Technologies
- From 1999–2007
- Five calls for tenders – new buildings
- Three calls for tenders – refurbishment of buildings
- Over 750 projects were submitted
- 250 projects have been supported
- More than 25 million € of public funding

Building of Tomorrow

map with demonstration buildings



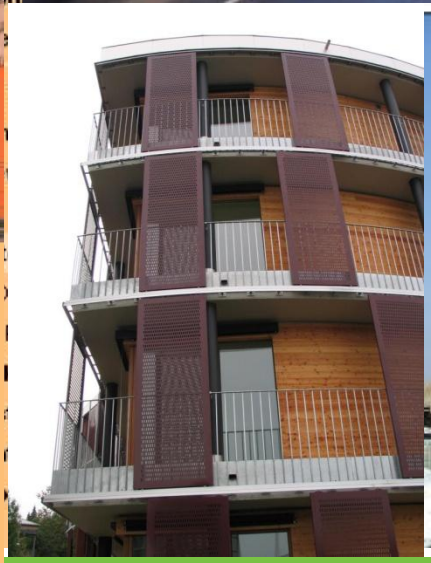
Building of Tomorrow – demonstration sites

Solar City Linz – Apartment complex

- Passive house standard for a multi family house complex
  - Use of new components and
  - Ecological materials
- Consideration of
  - Cost efficiency and
  - Acceptance of inhabitants

Building of Tomorrow – demonstration sites

Residential buildings



Building of Tomorrow - examples

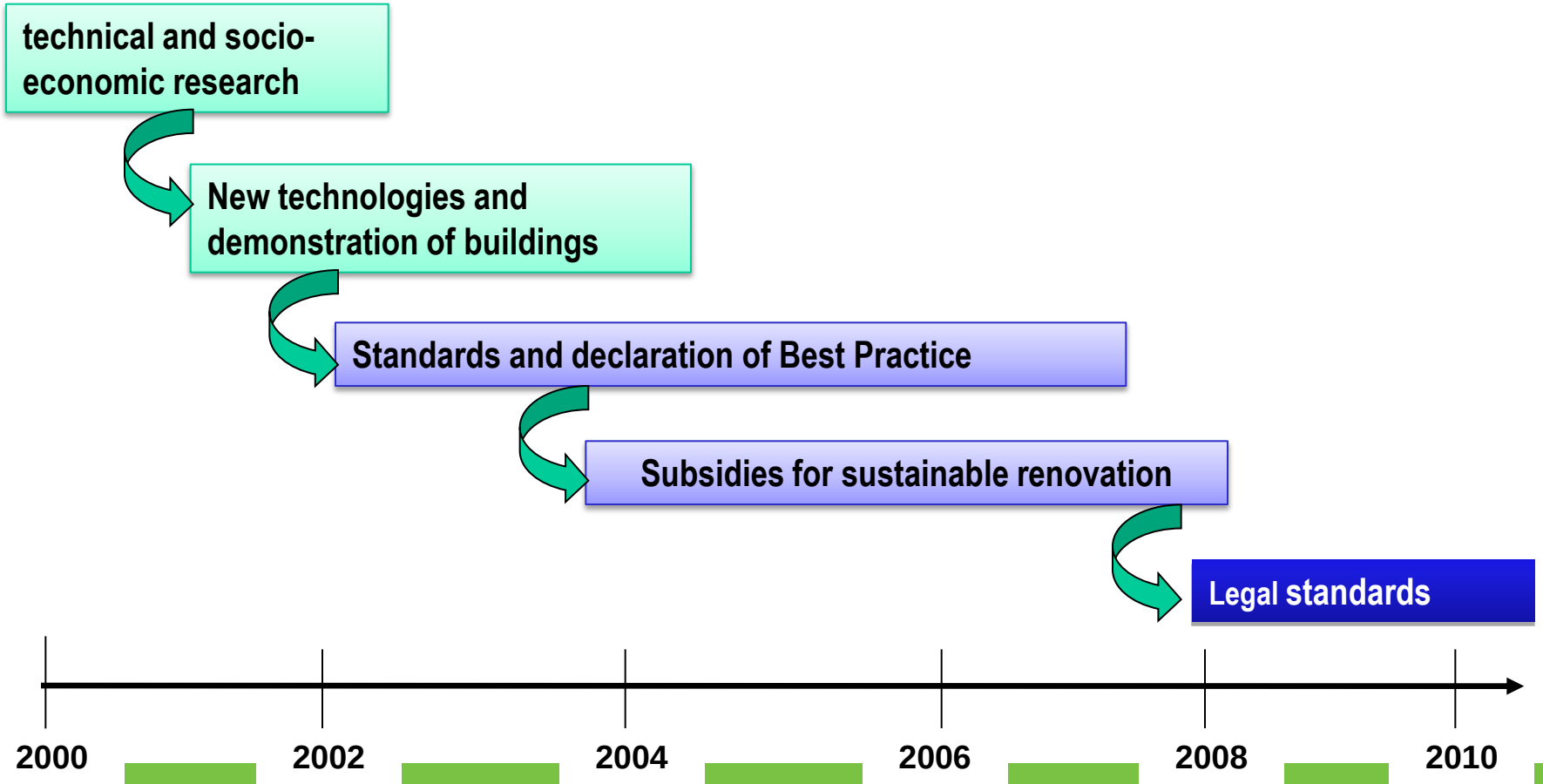
offices and other buildings

Building of Tomorrow – demonstration sites

offices and other buildings

From research to market

The strategy towards future markets



Best practice “Building of Tomorrow”

the outcome

By the end of the program:

- **25 demonstrations sites – proof that sustainable buildings perform best**
- **standard of sustainable buildings developed**
- **technologies and know-how within the research community**

The next step:

- **Dissemination of concepts, know-how and technologies**
- **Design of the program klima:aktiv buildings**
- **Adaptation of funding schemes and building codes**

klima:aktiv buildings – dissemination phase

2nd step within the general strategy

- **Based on the outcome of Building of Tomorrow, esp.:**
  - Definition of sustainable buildings (co funding of program owners)
  - niche markets for passive house buildings (<15 kwh/m^{2}a)
- **The results of the research program have been taken up by the program "klima:aktiv buildings"; the program aims at:**
  - 20 % market share for sustainable buildings
  - 25 % of ventilation systems (instead of conventional heating systems)
- **Main instruments used**: information, adaptation of subsidies, financial instruments, involvement of construction industry, training

The „klima:aktiv“ standard for new buildings

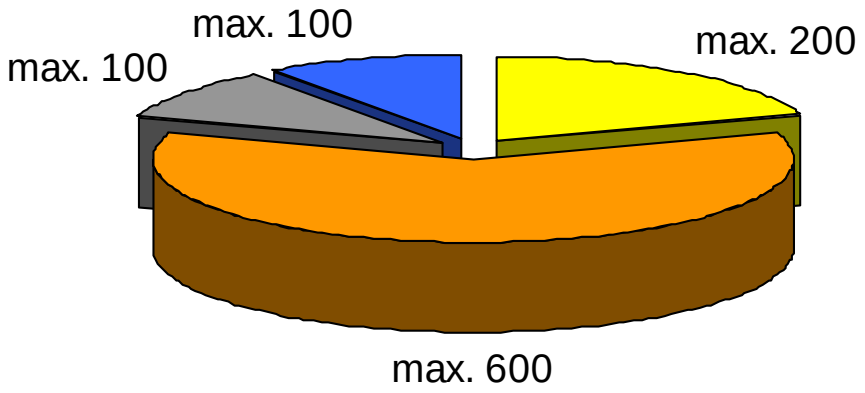
definition

Design and Execution
max. 200 points

Energy and Supply
max. 600 points

Materials and Construction
max. 100 points

Comfort and Indoor Air-quality
max. 100 Points



klima:aktiv Standard: max. 1.000 points

klima:aktiv **Haus** ≥ 700 points **klima:**aktiv **Passivhaus** ≥ 900 points

Energy and Supply

B	Energy and Supply		max 600
B 1	Heat demand and supply		575
B 1.1b	Passivhaus (PHPP)	M	575
B 1.3	Heat pump / district heat / CHP / biogenic combustibles		50-150
B 1.5	Solar water heating		45
B 2	Energy demand (electrical)		max 40
B 2.1	Ventilation system (energy efficient)	M	20
B 2.2	Lighting (energy efficient)		10
B 2.3	Laundry and dishes with connection hot water		10
B 2.4	Photovoltaic		35
B 3	Water demand		max 40
B 3.1	Fittings: water saving (standard)	M	20
B 3.2	Handwashbasin water saving (optimised)		10
B 3.4	Showerhead water saving (optimised)		10

Building of Tomorrow – klima:aktiv buildings

not more of the same

Building of Tomorrow	klima:aktiv buildings
RD&D	Information, trainings, subsidies ...
High public funding	Standard funding schemes
Demonstration sites – niche markets	From niche markets towards main market
Competitive concepts	“klima:aktiv Standard”
Target group: Research community	Target group: customer, industry, stakeholders

=> Change of communication strategy and instruments

Instruments for dissemination

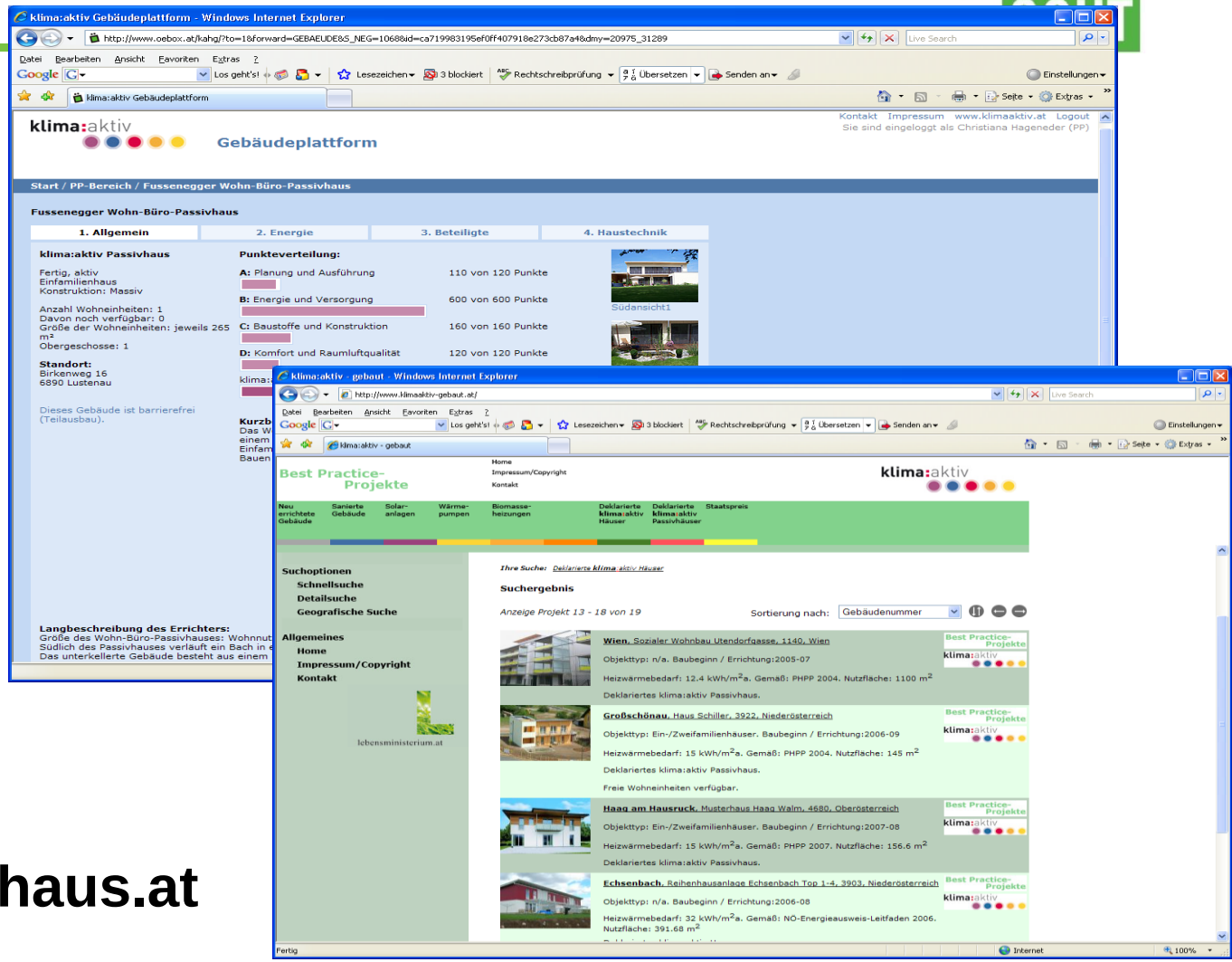
the more the better

- **Financial instruments**
  - Subsidy schemes of Federal States
  - Special loans from private banks
- **Trainings for**
  - Craftsmen
  - Salesmen of prefabricated houses
- **Partnership with industry**
- **Use of information instruments (brochures, internet, exhibitions ...)**

Information – learn from your neighbor

More than 1.000 declared buildings online

An instrument to avoid the “Valley of Death” for innovations



www.klimaaktivhaus.at

Statement from the government

2007

- **50 % residential buildings in klima:aktiv Standard in Austria**
- **from 2015 on: Funding of Residential Buildings only for klima:aktiv passive houses**

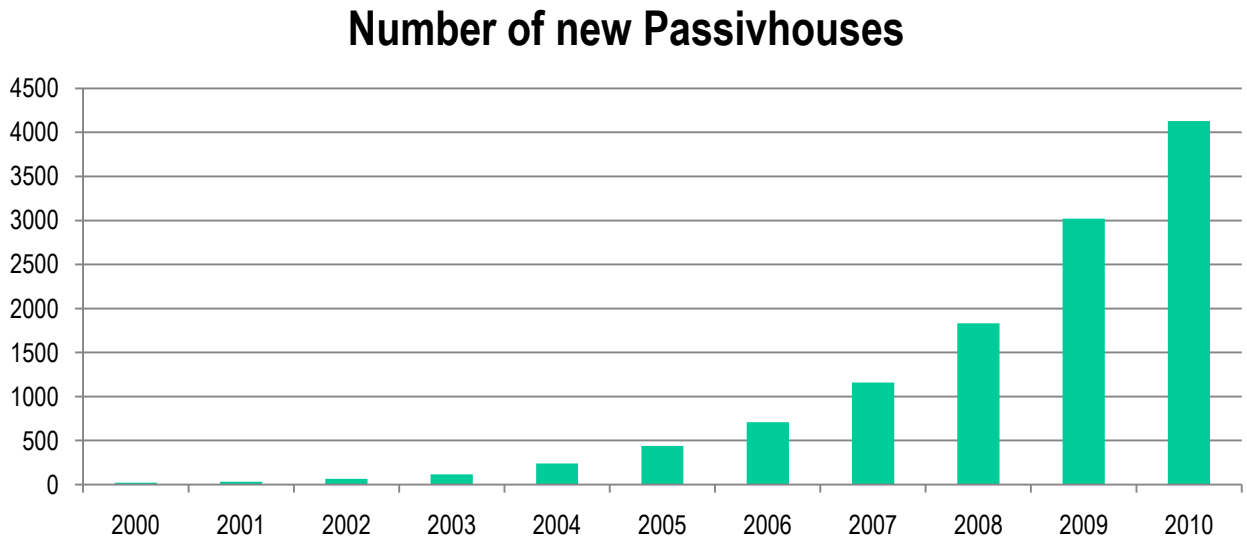



The outcome

with regard to markets

- most of the klima:aktiv criteria implemented by Federal States through building subsidies
- share of klima:aktiv houses of all new buildings: up to 10 % for certain markets/regions
- rapid increase in passive houses since 2005

source: IG passive-house database

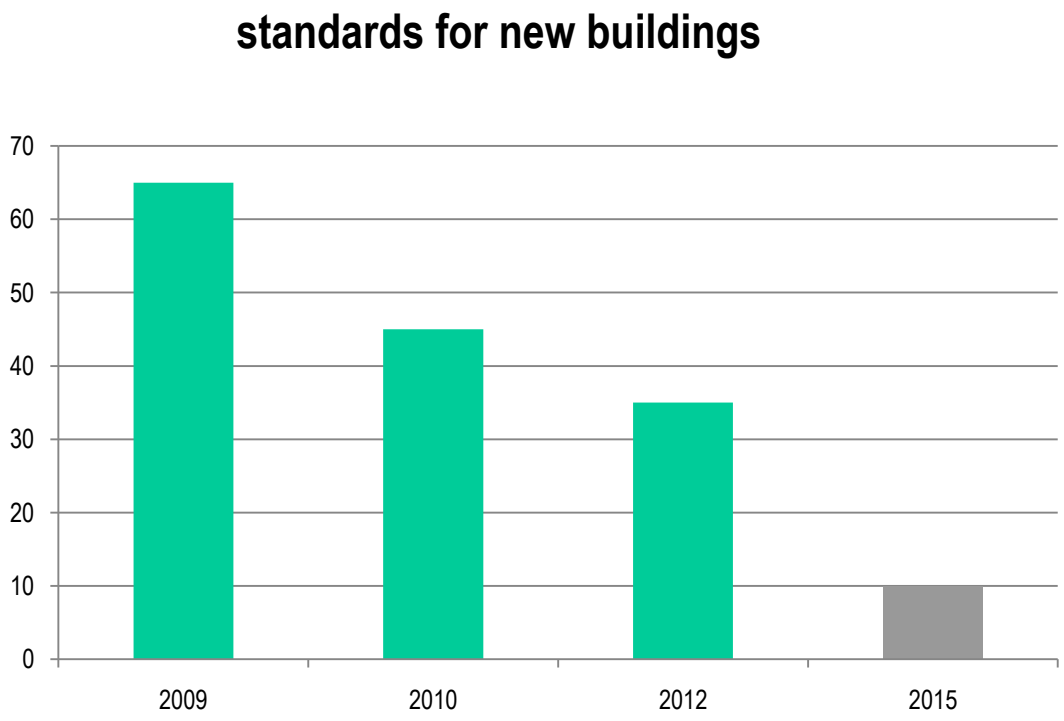


Regulatory framework

from niche markets to standard

- Contract between Federal States (Länder) and Federal Government with regard to funding schemes

- Stricter regulations in some Federal States already
  - Use of renewables (Styria, Upper Austria)
  - Passive house standard for social housing (Vorarlberg)



Lessons learned

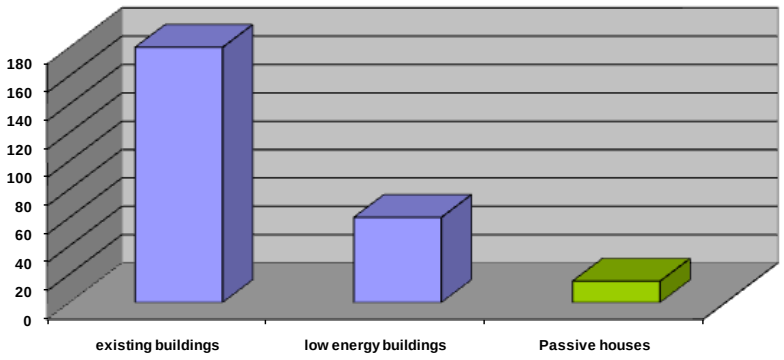
Based on the Austrian experience

- ✓ Start thinking from market not from technology
- ✓ Send a clear message to market players
  - ✓ Definition of sustainable buildings
  - ✓ Longer-term regulatory framework
- ✓ Change instruments from Research to Market
- ✓ Subsidies do help to generate an uptake of technologies by the market
- ✓ New buildings first, renovation second, due to complexity

Lessons learned from Eracobuild

Based on the experience of European Programs

- ✓ **Major steps with regard to energy efficiency and reduction of CO_2-emissions are visible:**
  - ✓ For all climates and construction types
  - ✓ At comparable investment costs and lower energy costs
  - ✓ High social acceptance through increase of comfort
- ✓ **R&D programs in building technologies**
  - ✓ Need continuous public support
  - ✓ Are the basis for sustainable markets in the building sector



Further options and needs

For building technology policy

- **Target oriented R&D activities must be intensified**
  - Novel building concepts
  - Including socio-economic research (esp. in renovation)
  - Target oriented development of components and know-how
- **High efficient building technologies must be adapted to climates and local resources**
- **International cooperation in R&D needs to be intensified**
- **Various instruments are needed to overcome barriers to innovation in the construction industry**

Further options and needs

Future research needs

- **Next generation "Energy producing new buildings"**
  - Building integrated PV modules and solar thermal technologies
  - Microturbines (10–500 kW) based on biomass
  - solar cooling
  - Integration into the electricity grid
- **Rethink the energy system based on sustainable buildings**
- **Renovation of the existing building stock based on "factor 10 concepts" and technologies**

=> R&D in building technologies has to play a vital role in any sustainable energy system

Building of Tomorrow PLUS

- **The idea:**

„From Zero-Energy-Buildings to PLUS-Energy-Buildings“

- **from 2008–2012**
- **Budget 35 Mio. EURO**

PLUS means

Future research needs

PLUS buildings as generators of energy

PLUS strengthening technological leadership

PLUS from buildings to settlements

PLUS from single to series manufacturing

PLUS intensified networking and education

PLUS ...

Future never ends!

Thank you for your attention!

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