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ECBCS Annex 51

Energy Efficient Communities

Case Studies and Strategic Guidance for Urban Decision Makers

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Volkswohnung GmbH, Karlsruhe

Helsinki, 31th August 2009

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Energy Efficient Communities

Targets:

- **reduce energy demand**
- **improve efficiency**
- **increase use of renewables**

→ Tasks:

➢ **improve buildings efficiency**
- refurbishment
- standfards for new buildings
- optimisation of technical equipment

➢ **install decentralised energy supply**
- cogeneration
- waste heat
- renewables

➢ **drive behavioural changes**

➢ **improve transport efficiency by**
- using efficient cars
- using bikes whenever possible
- extend public transportation

Why an Annex on Community Systems?

New high-tech building standards:

- „Passive House“ standard
- net-zero energy
- self-sufficient buildings
- plus-energy buildings

→ energy consumption driven to zero!

Problems:

- cost efficiency
- directed to residential buildings (primarily)
- market diffusion rate

Germany: ~ 10.000 „Passivhaus“ buildings in 2007 → < 5 % of new buildings
~ 17 mill. residential buildings

→ existing building stock must be refurbished

→ technical options not used:
- DH / CHP
- LowEx-technologies
- renewables

„economy of scale“ → many buildings → **community systems!**

Potential results:

- even better than Passivhaus standard (fossil energy consumption, CO_2-emission)
- more cost effective
- higher implementation rate
- available with existing technologies

Consequence:
Integrated approach necessary!
→ examples: FR, Helsinki

2 „*Passive House*“-Examples

Heating demand:
15 kWhth/(m².a)

PE-demand (typically):
40 kWh/m²

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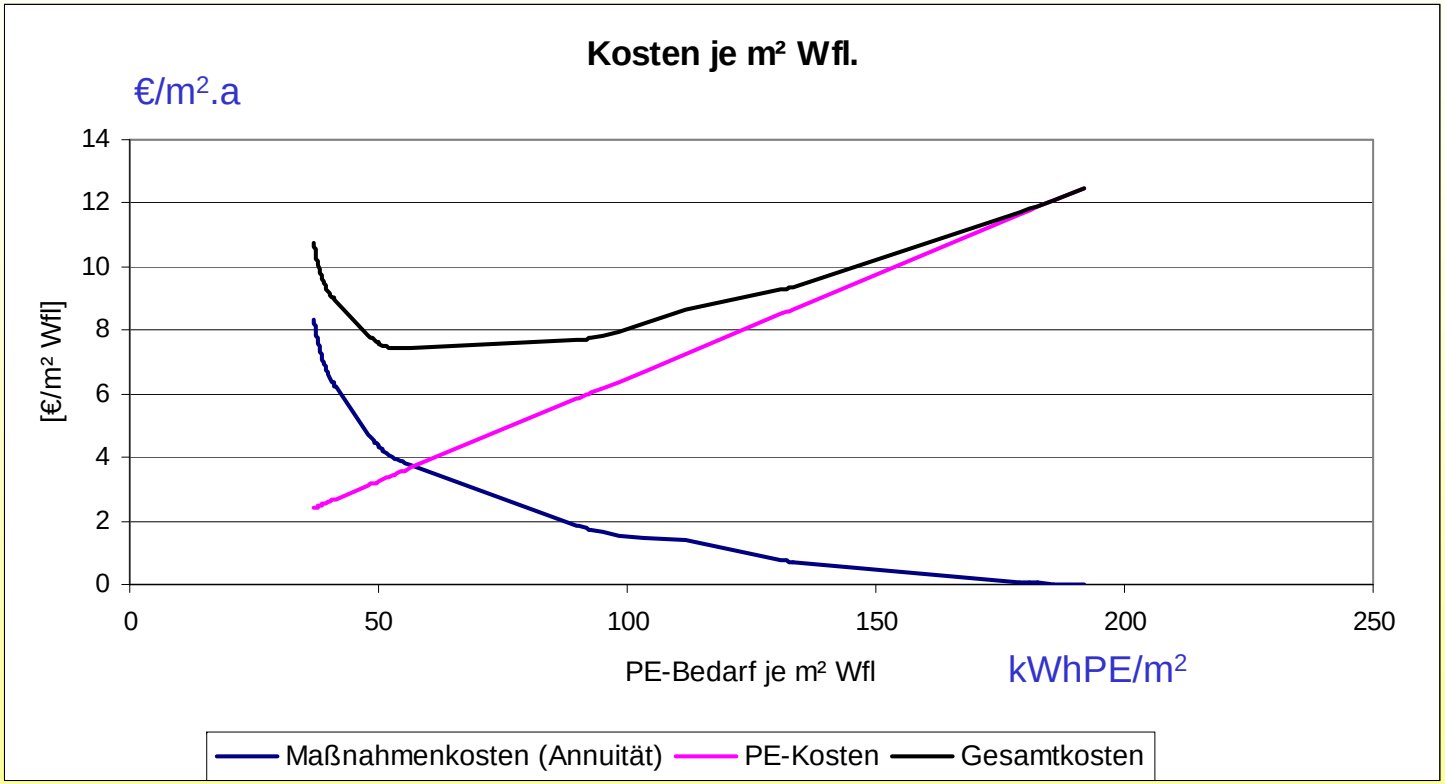
Retrofit of existing buildings, Karlsruhe: 375 flats

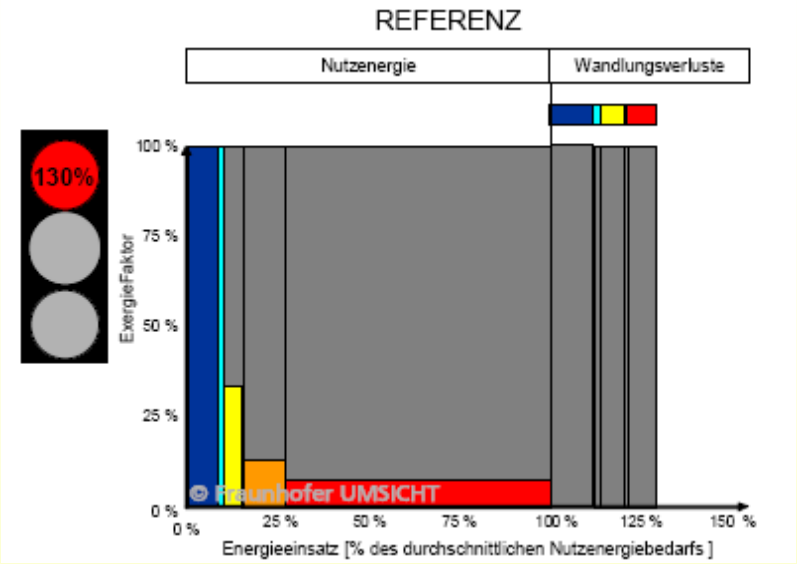
Energy demand for heating / DHW: < 40 kWh/m²

Cost-optimized combination of measures in multi-family building retrofit: (model calculation; 70 €/MWh$_{PE}$)

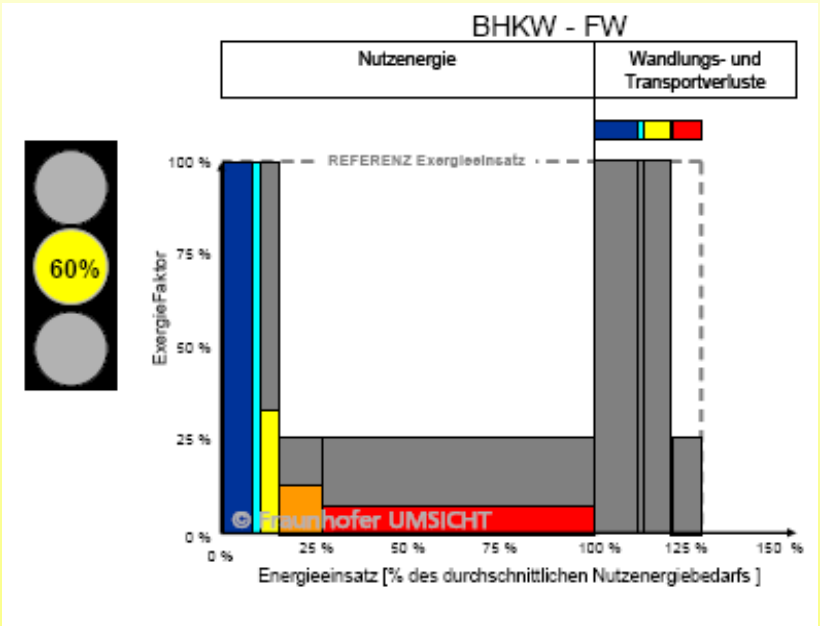


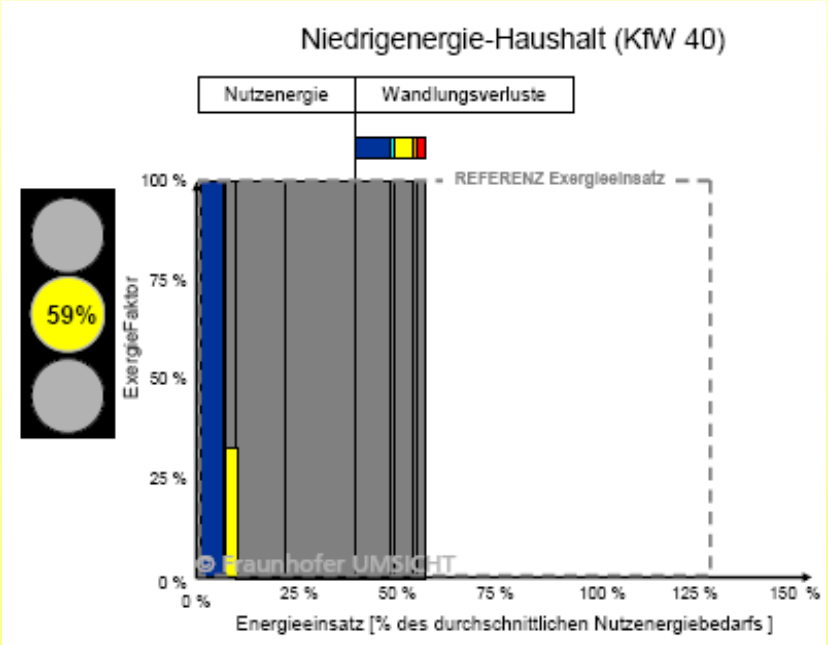
Conclusion:

below 40 – 50 kWh/m^2 heating demand: non-linear cost increase



Fraunhofer UMSICHT Oberhausen:
„Exergy Fingerprint“





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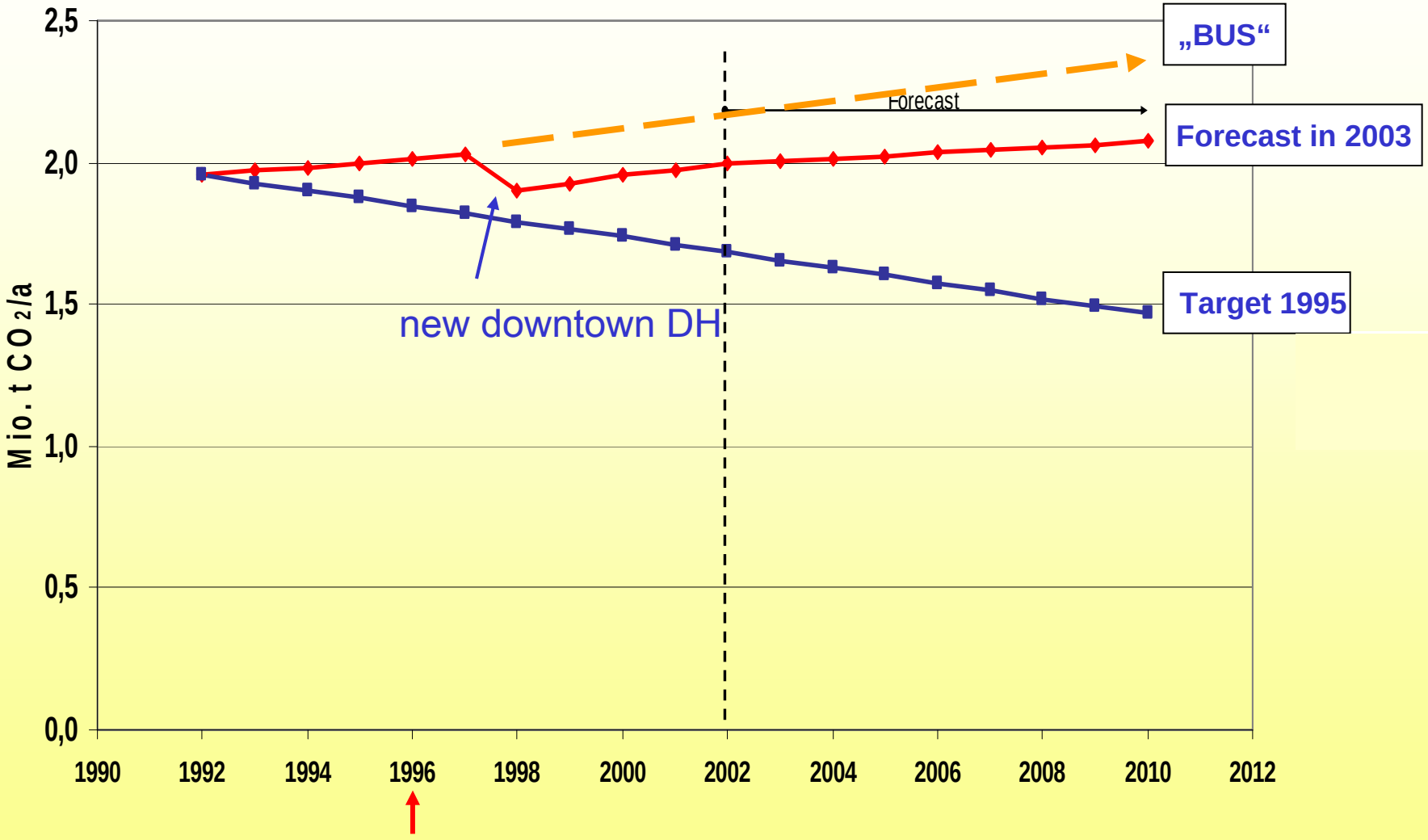
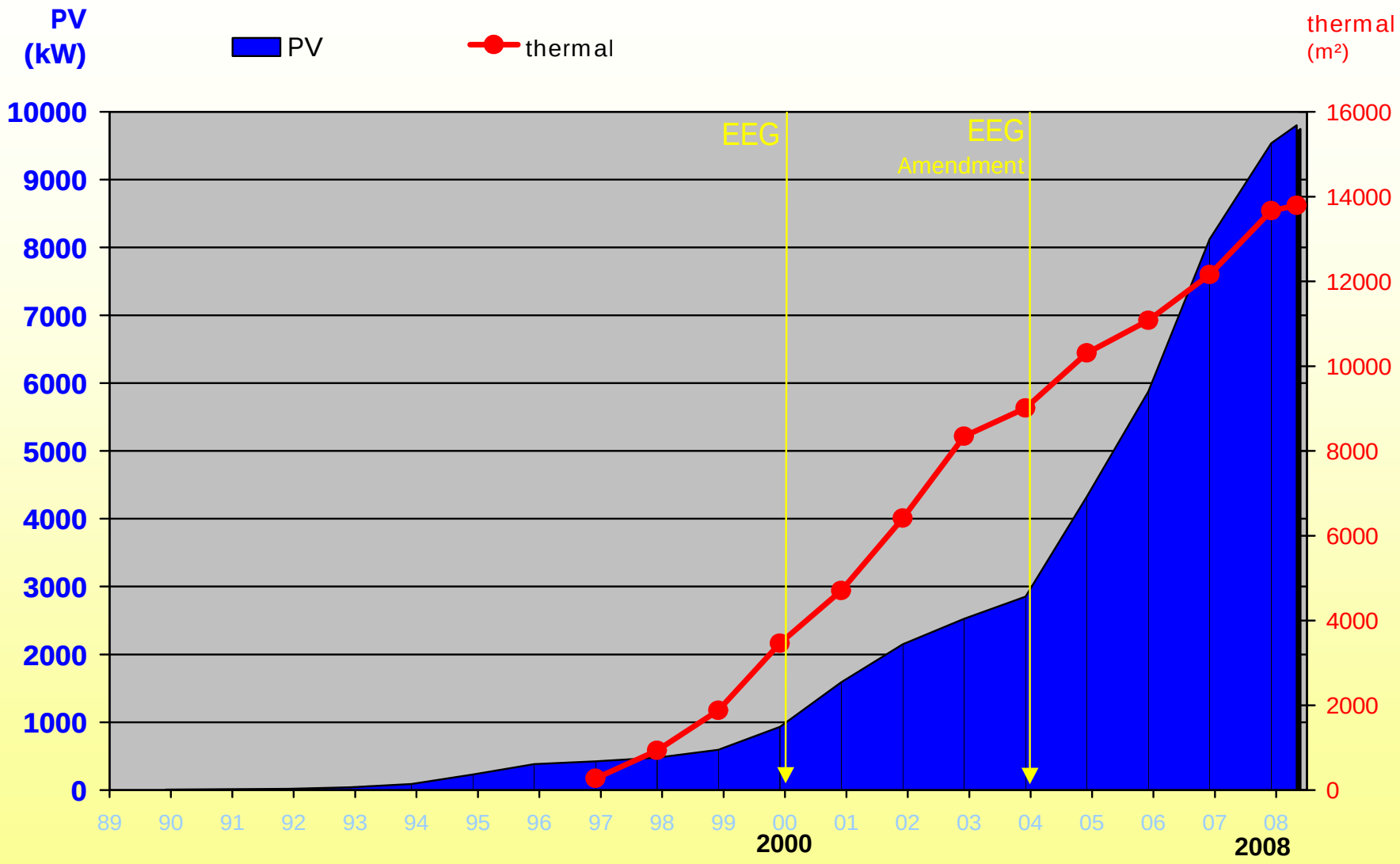
Example: Climate Change Plan Freiburg 1995

wish and reality



Solar installations in Freiburg



Electricity demand in FR: ~ 200 MW_{el}

→ PV-Capacity: ~ 2.5%

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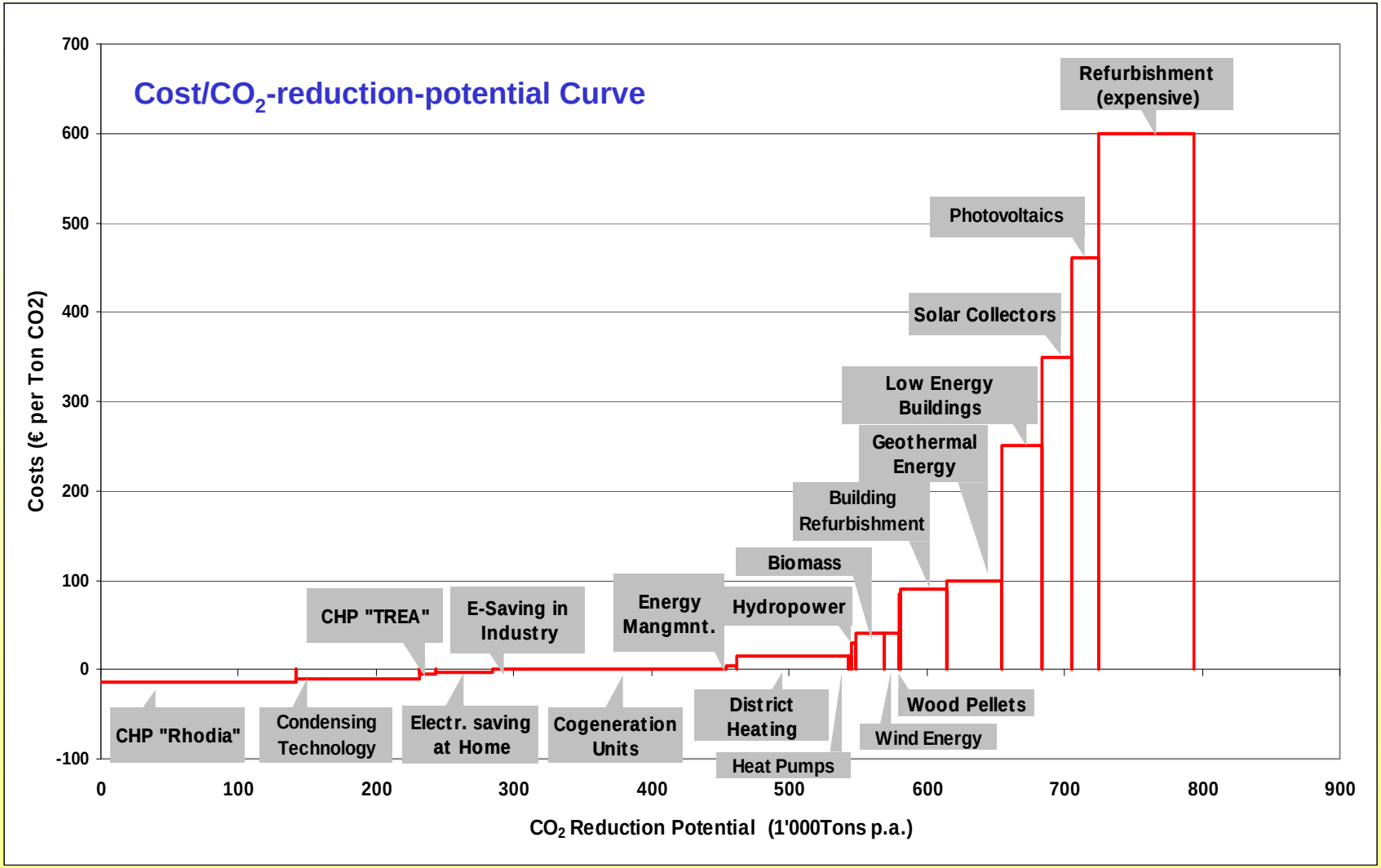
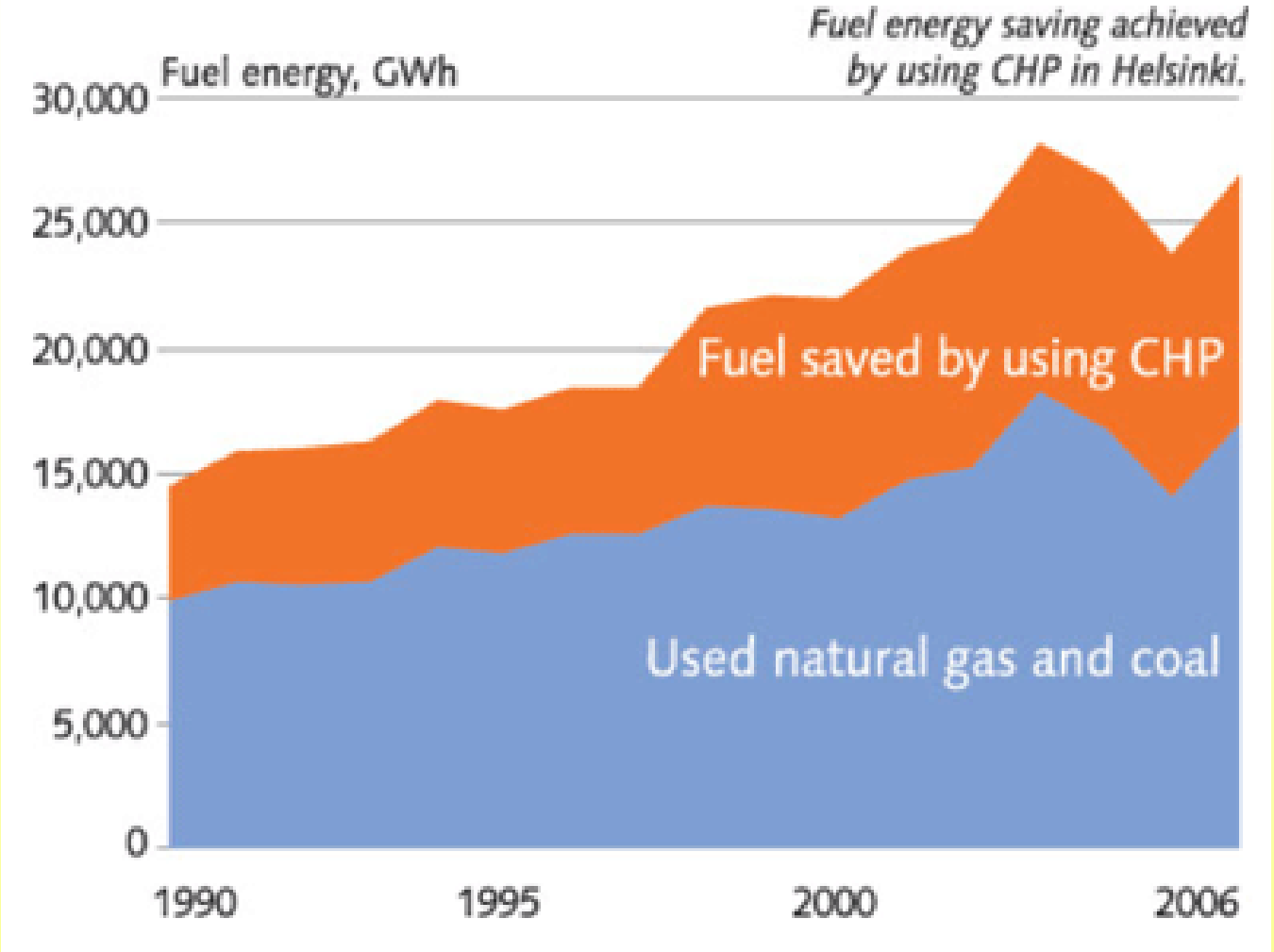
Freiburg 2004 (200.000 inhabitants)



Examples: Clinton Foundation / C40 Cities

Case Studies on exemplary city strategies:

	main focus
Seattle	commercial and residential green buildings
Helsinki	centralized DH with CHP and Biomass (and „DC“)
Kotka (SF)	centralized CHP DH system with biomass
Toronto	Energy Agency with revolving „TAF“ for innovative projects with good ROI
Freiburg	integrated sustainable neighborhood development, (DH/cogeneration, solar, high insulation standards; „eco-transportation“)
Dongtan (planned)	CO_2-neutral city by - efficiency, recycling - DH / DC, renewables - public traffic services - urban plan for „short distances“
Växjö (S)	plan: CO_2 – neutrality until 2015 / 2020 by - building refurbishment plan - renewables DH/CHP for heating supply (biomass, solar) - biofuels for transportation
Woking (UK)	decentralization of electricity supply by (small) cogeneration



Source: Helsinginenergia (2007)
www.C40cities.org

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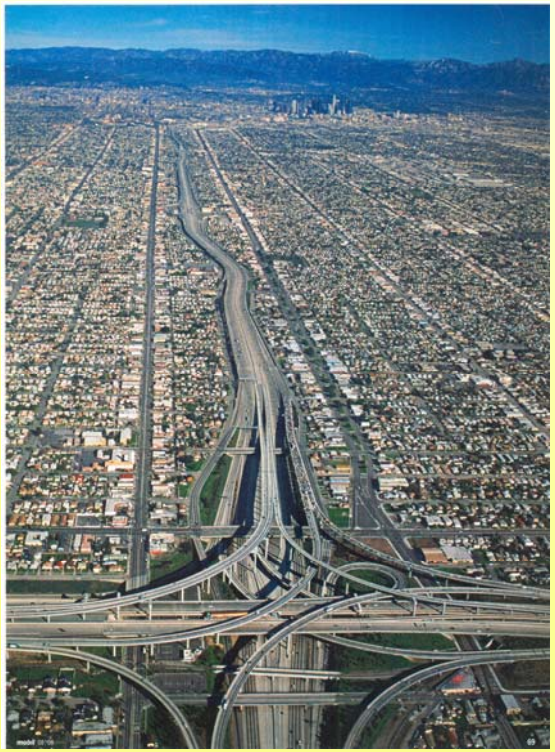
What is a „community“?



Conclusions of preparation phase:

(1) Efforts must focus on economic efficiency and high **implementation** rate

(2) Objective of new Annex:

Integrated energy plans and their implementation strategy
- Neighbourhoods
- Towns / cities

(3) Difference to conventional Annexes:

→ focus on
- instruments
- institutional framework
- strategies
- tools
- communication and marketing (of visions and concepts)

→ aim is **economic solutions** rather than technical innovations

→ **local administrations** must be involved

(4) No standard solutions:

Variety of „communities“ must be considered

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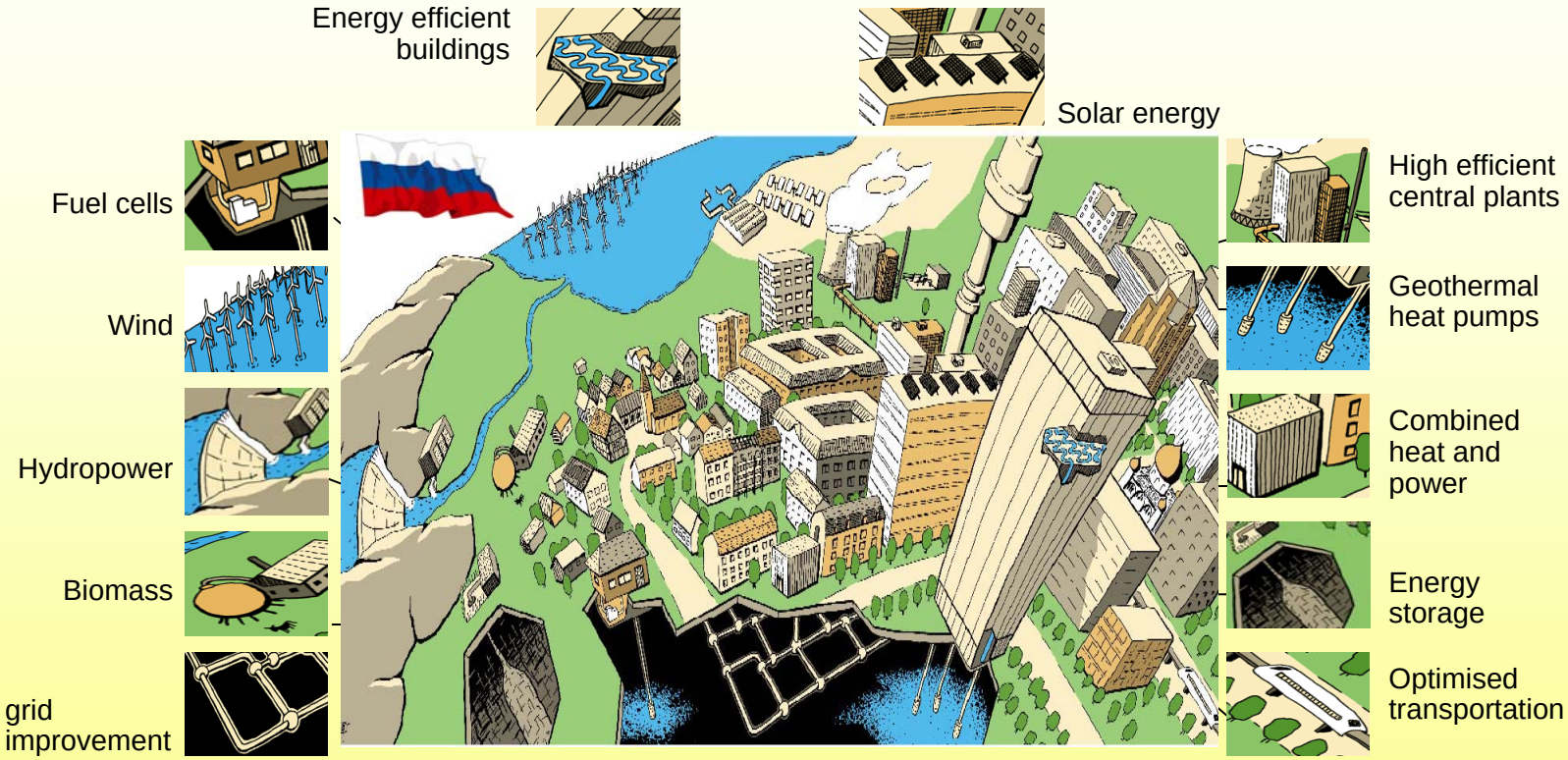
„Sustainable city“ …

... is attained by a combination of existing technologies that can be used locally to achieve the required level of energy consumption.



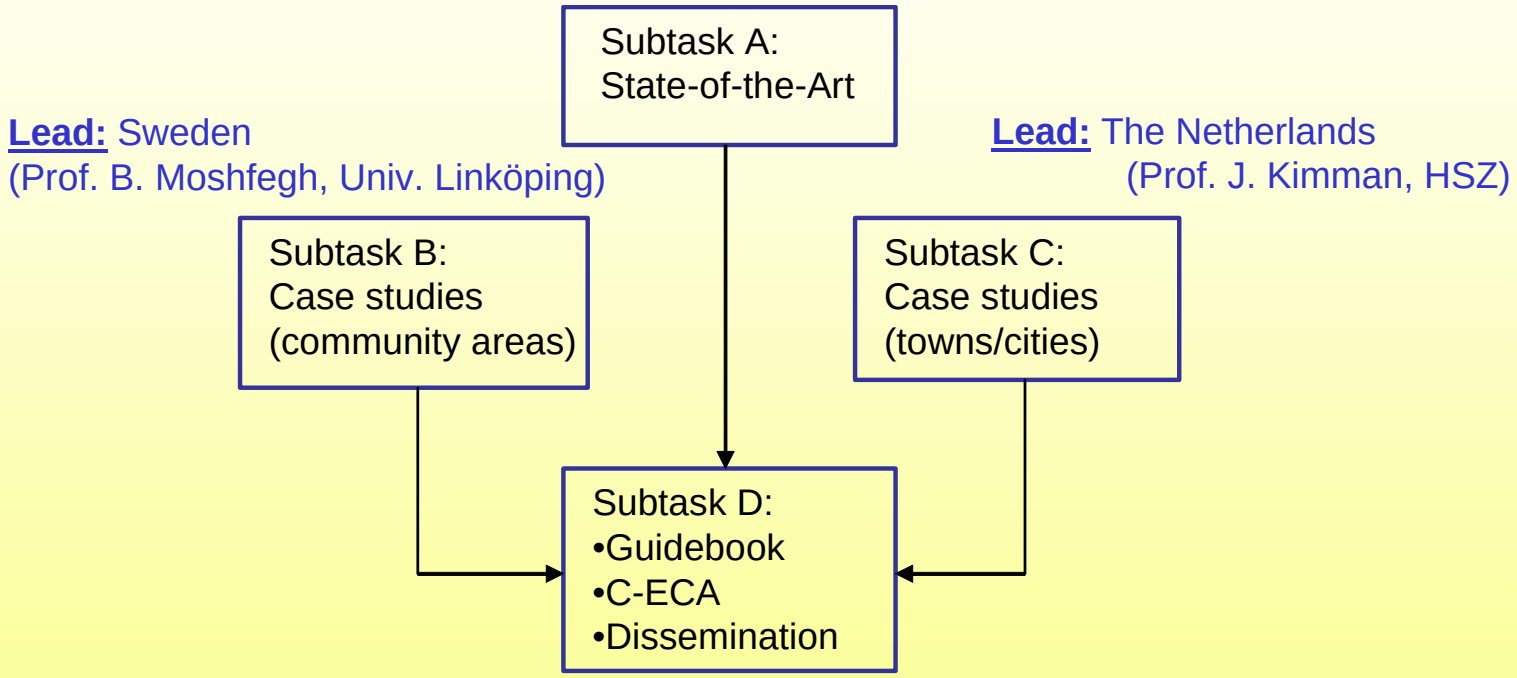
Economic efficiency by integrated system optimisation

Source: EnBW AG, Karlsruhe

Annex 51 time plan: start January 2009, end June 2012

Annex 51 Structure

Lead: France
(J. Ghisgant, EiFER)



Lead: Germany
(H. Erhorn-Kluttig, Fhg-IBP)

Annex 51 participants: (June 2009)

- Germany (Operating Agent, Lead Country for Subtask D)
- The Netherlands (Lead Country for Subtask C)
- Sweden (Lead Country for Subtask B)
- France (Lead Country for Subtask A)
- Japan
- Canada
- Finland
- USA
- Switzerland
- Austria
- Denmark (?)