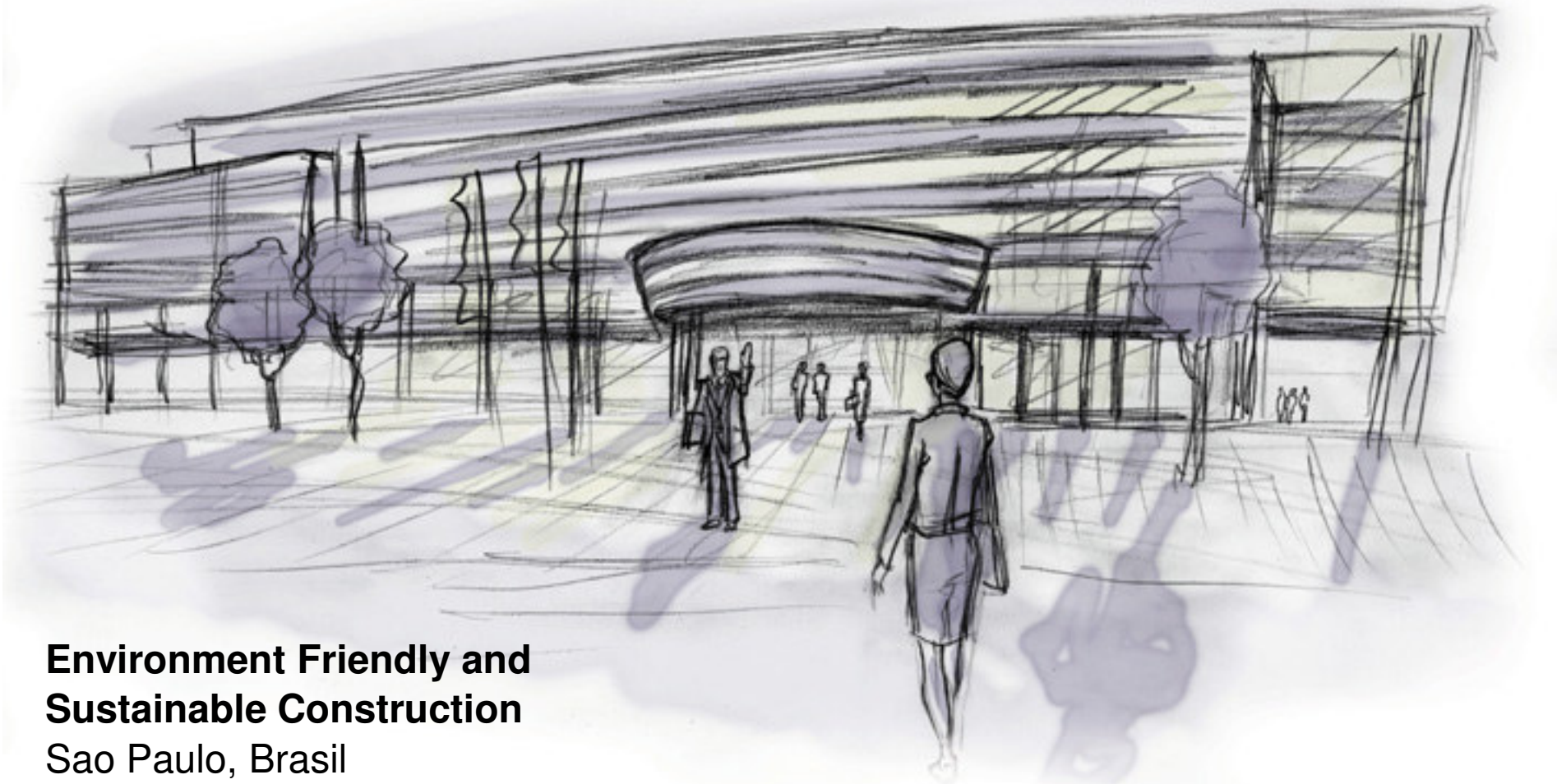


Energy saving

concepts in construction

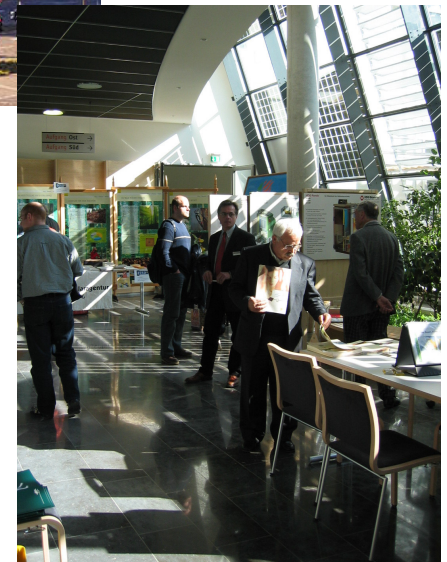


Environment Friendly and Sustainable Construction

Sao Paulo, Brasil

November 2008

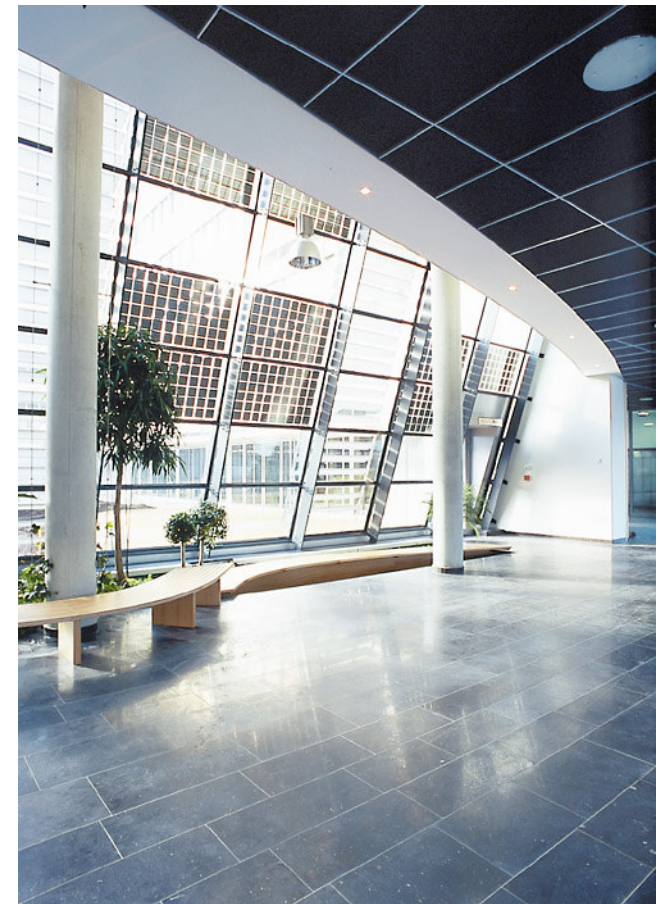
Solar Info Center – Freiburg, Germany




Solar Info Center, Freiburg

solar info
center

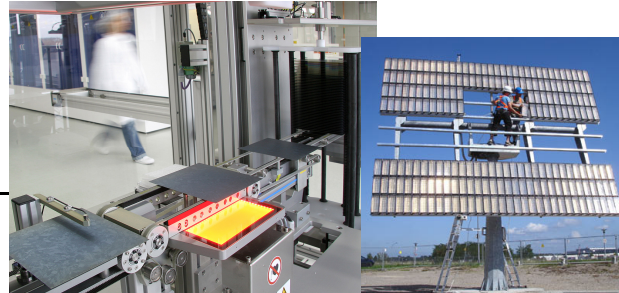
- The service center for all aspects of sustainable building and habitation: energy efficiency, renewables and ecological building materials
- 15.000 m² for research, development, application, design, consulting and education
- 45 companies and institutes with more than 350 employees
- The platform for a growing branch
- Innovative solutions at conventional costs
- Owner: Oppenheim Immobilien-Kapitalanlagegesellschaft mbH
Provinzial Rheinland Lebensversicherungs AG, Düsseldorf



What customers find...

solar info
center 

- technical competence



- planning, consulting, project developing, product engineering



- education & training



- exhibitions, public relations




- e Lounge & Solar Casino



Infotage

violin concert

What a *Solar Info Center* offers for customers...

solar info
center 

Innovation and established concepts

- The building concept of the Solar Info Center combines mature technologies with the state of the art
- The applied concept reflects actual economic solutions but in some parts of the building, research and development of new technologies never stops



Research and Development in the Solar Info Center

- Not far away, we get to the Fraunhofer SOBIC. This demonstration center is part of the Fraunhofer Gesellschaft and it works in the field of construction techniques for industrial and office buildings.
- The SOBIC exhibits examples for summerly heat protection, jalousies, adaptable glazing, solar claddings



Fraunhofer Gesellschaft



Courtyard



- On sunny days you can sit in the courtyard
- You can see the Photovoltaic elements from this place. The main part of the photovoltaic installation is on the roofdeck

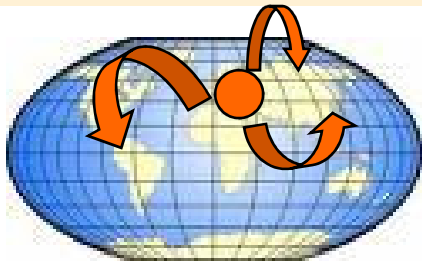


SIC International

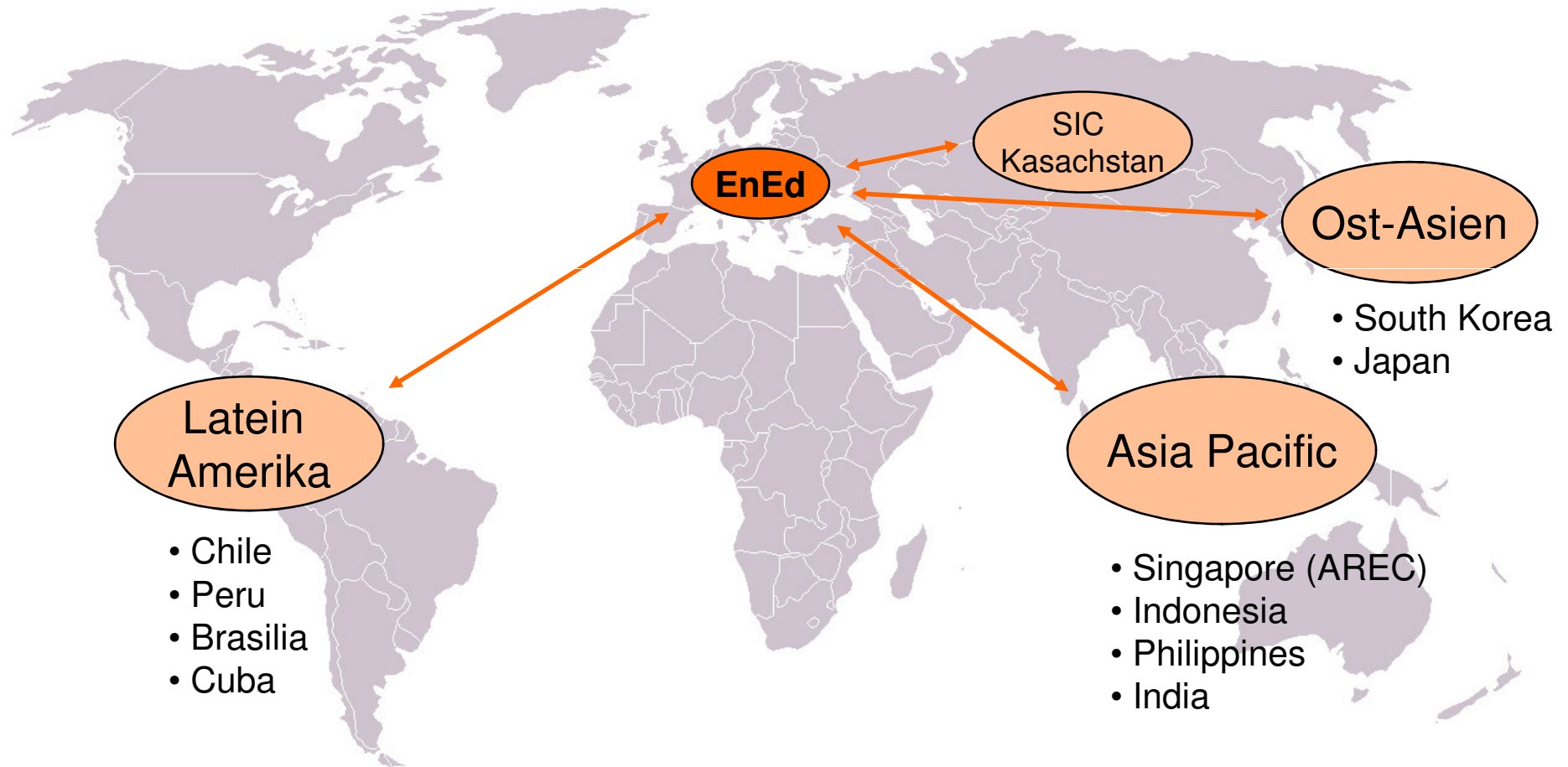
International Networking

solar info

center



- technology centers network net-e
- Exchange and collaboration for expertise in renewable energies



EnEd – International Education Center for Energy Solutions

- consulting

 - institutions
- platform for education

 - governments / administrations
 - companies
 - human resource management
- education for facility management

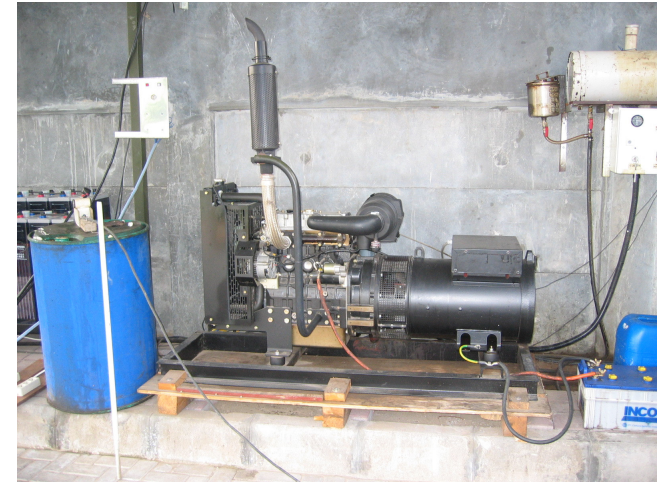
 - technical seminars
 - building training
 - estate managers
- international education academies

 - teachers training
 - maintenance technicians
 - for emerging and transitional countries
 - service for schools
- university education


 - know-how transformation for renewable energies and energy efficiency
 - producers for facility management tools
 - cooperations with universities and distance learning universities
 - technicians, engineers, architects
- all courses include business- and financial components

EnEd – International Education Center for Energy Solutions

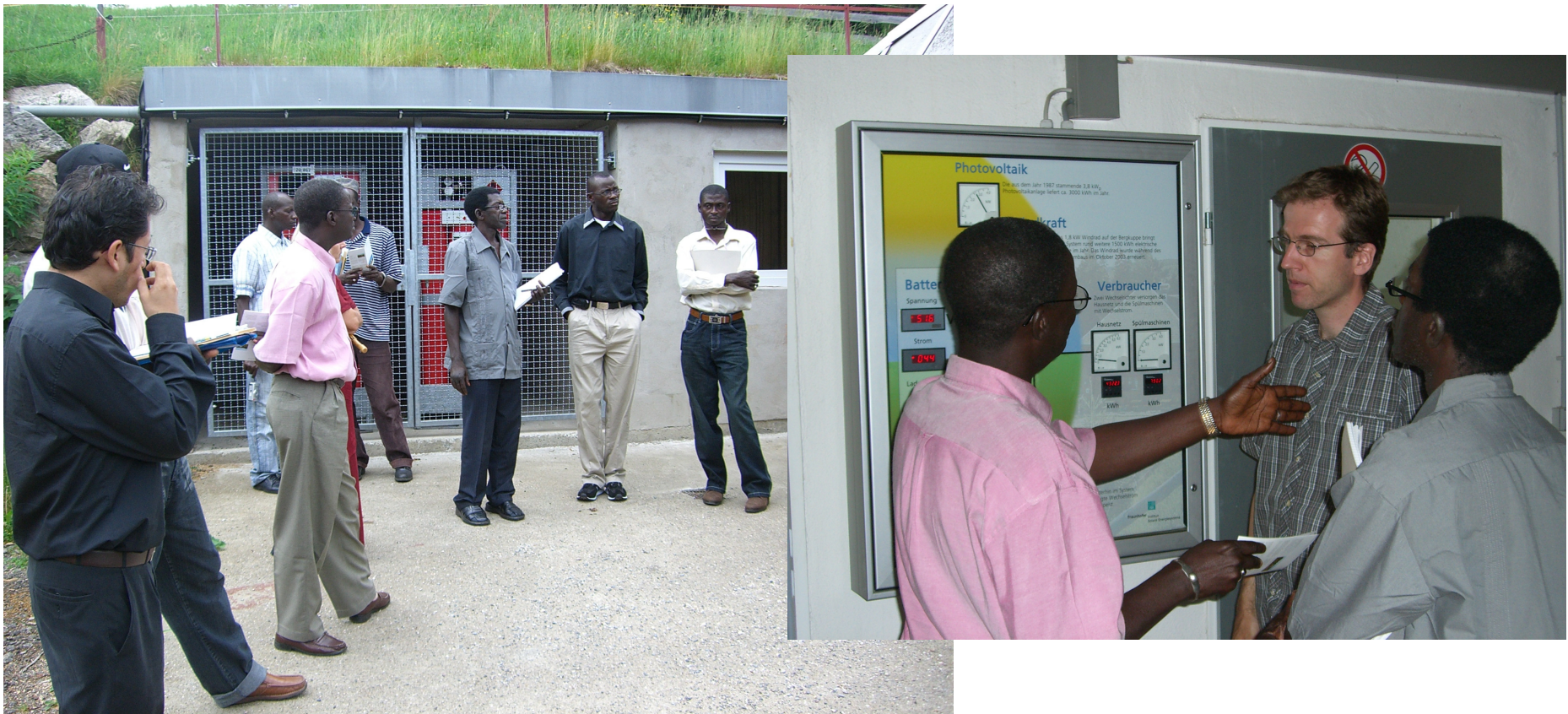
- Seminars in Singapore and Indonesia
 - Wind Energy
 - Energy Efficiency
 - Solar Cooling
 - Biomass Cogeneration




EnEd – International Education Center for Energy Solutions

solar info
center 

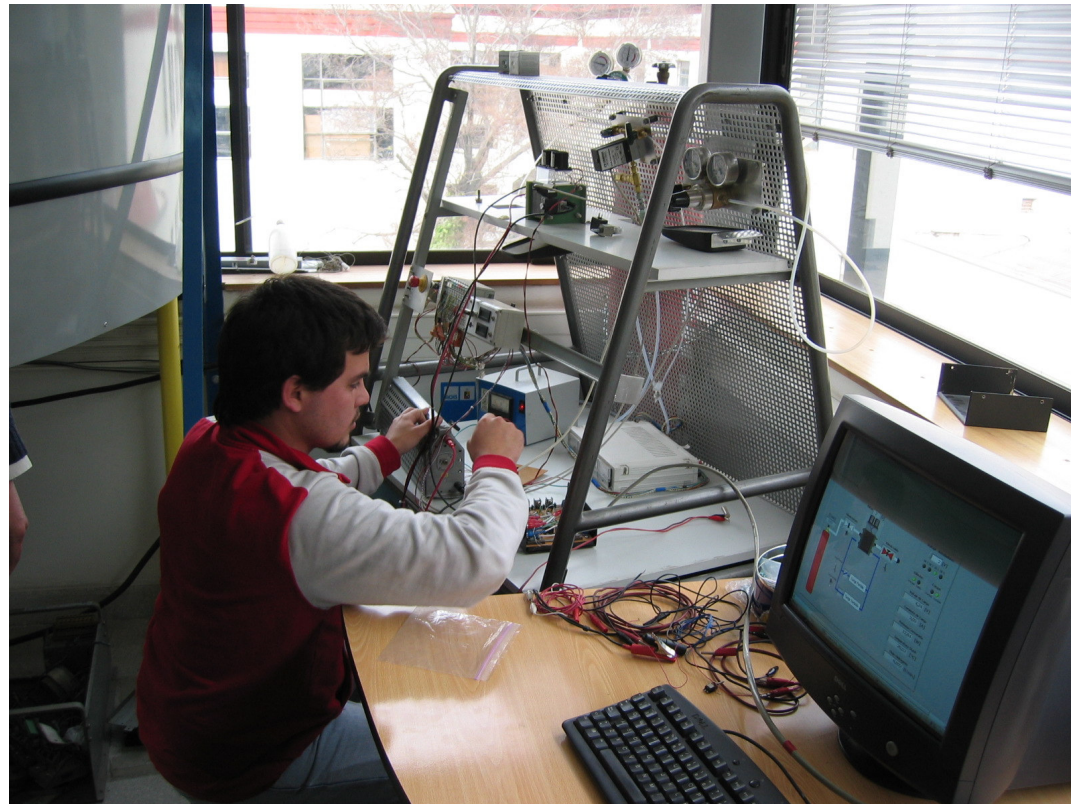
- Workshop in Freiburg
for technical engineers from Gambia > Photovoltaic – stand alone systems




EnEd – International Education Center for Energy Solutions

solar info
center 

- Seminar in Santiago
Universidad de Chile
 - Wind Energy
 - Biomass
 - Solarthermal
 - Energy Efficiency



EnEd – International Education Center for Energy Solutions

solar info
center 

- Seminar for architects in Seoul, South Korea,
Hanyang University

➤ environmental – friendly
and sustainable construction

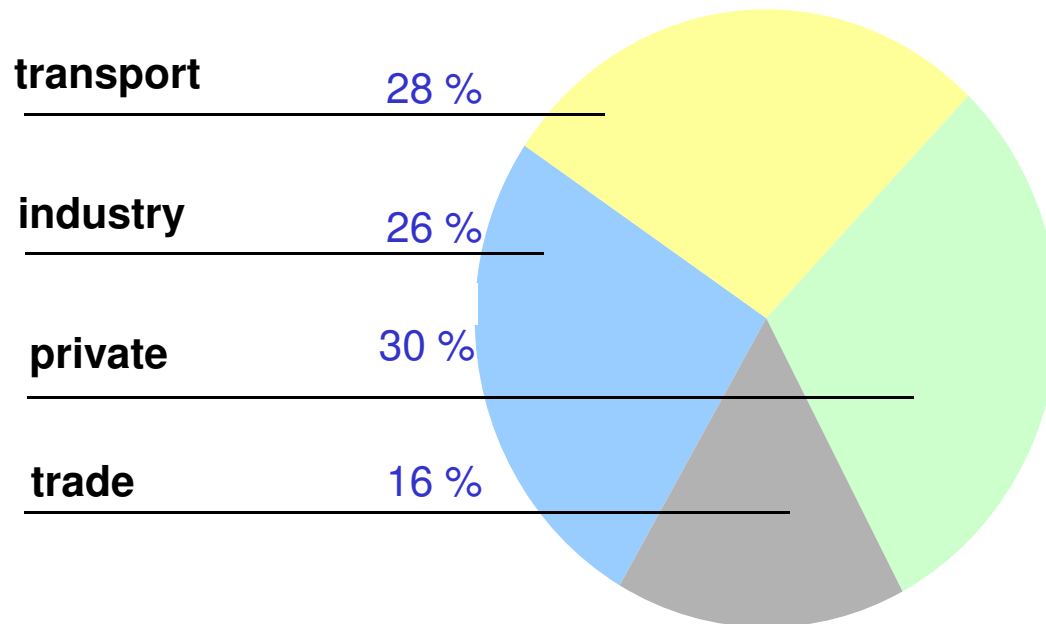


End Energy Consumption Worldwide

Definition:

End Energy

Energy input to the heating, cooling or hot water system to satisfy the energy need for heating, cooling or hot water.

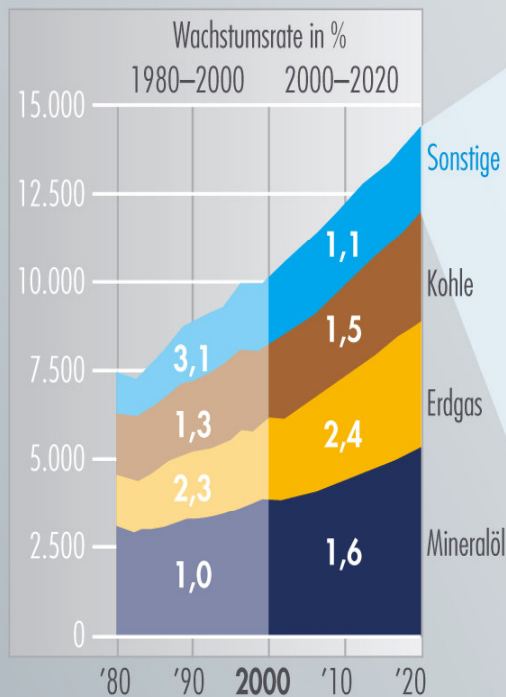


Quelle: Arbeitsgemeinschaft Energiebilanzen

Global energy demand

Weltenergiebedarf in Millionen Tonnen Öläquivalent [OE]

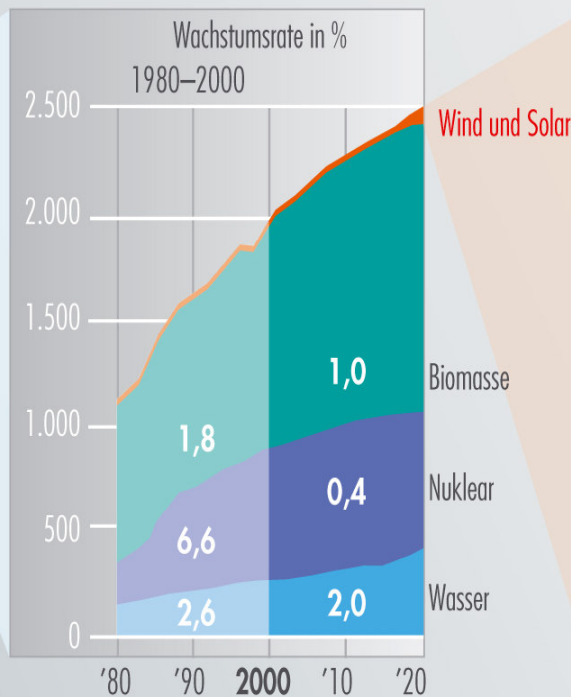
Energiebedarf gesamt



Total energy demand

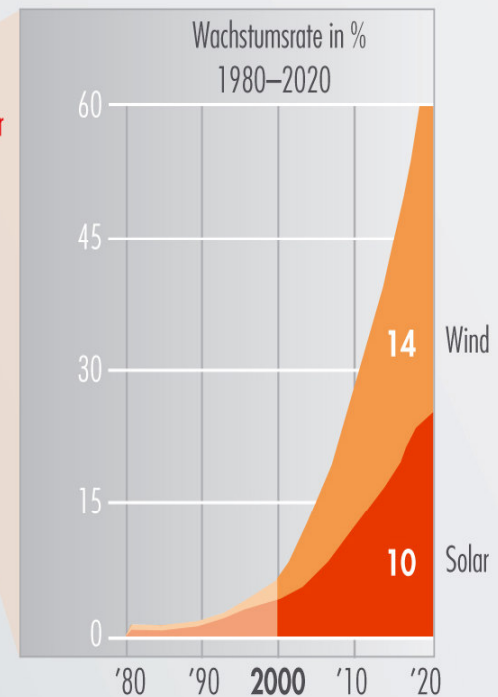
Quelle: Esso

Sonstige Energieträger



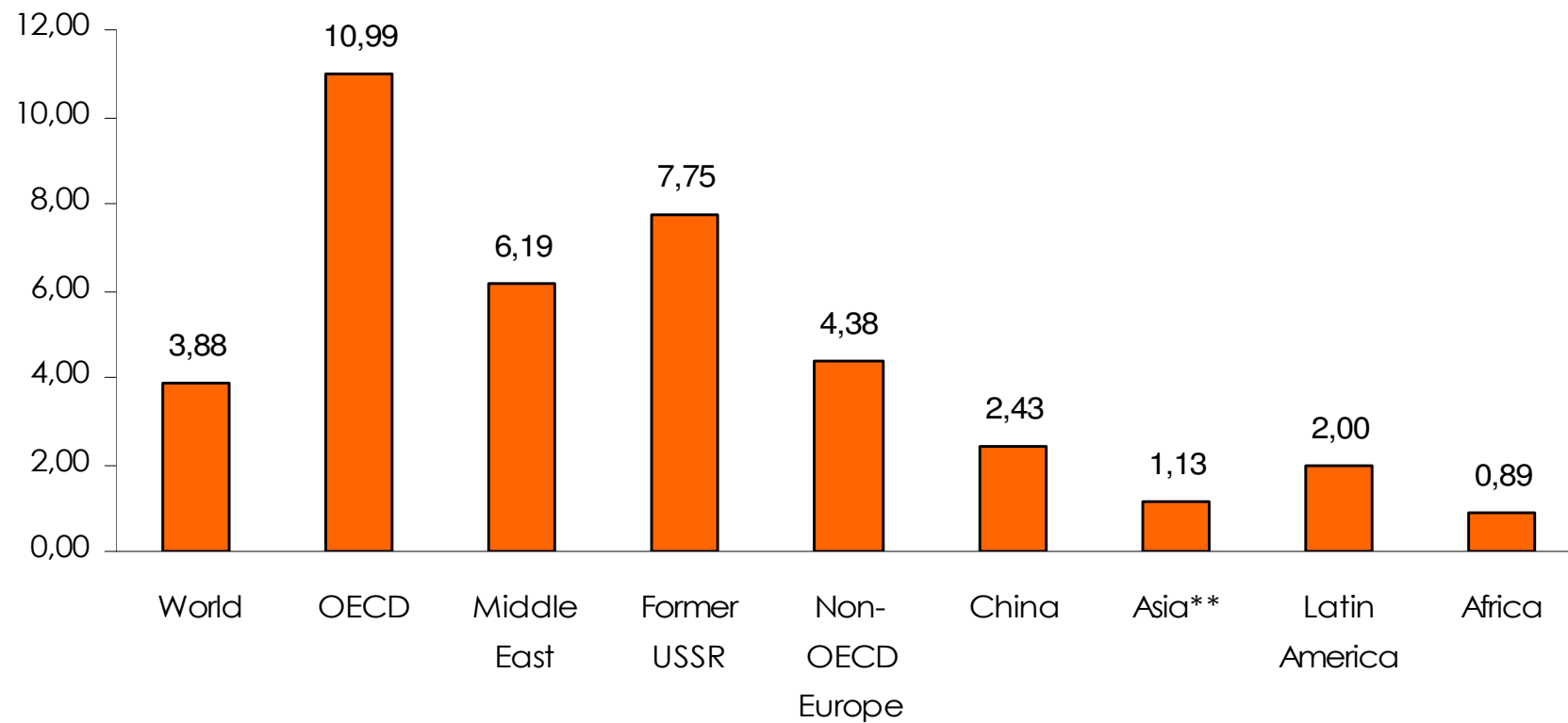
other sources of energy

Wind und Solar



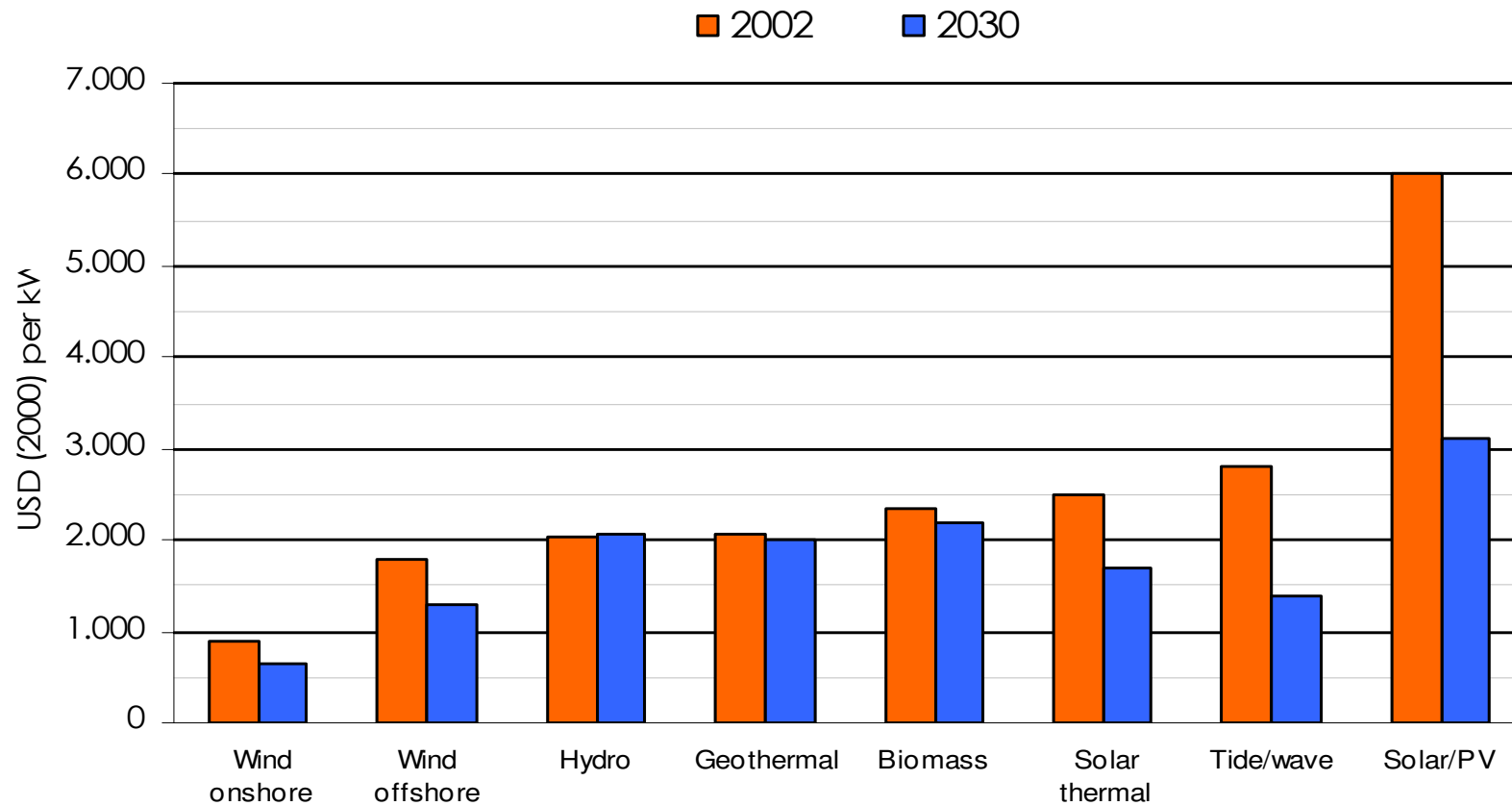
wind and solar

Regional Indicators*
(CO₂/Population [t CO₂/capita])



International Energy Agency, WEO 2004

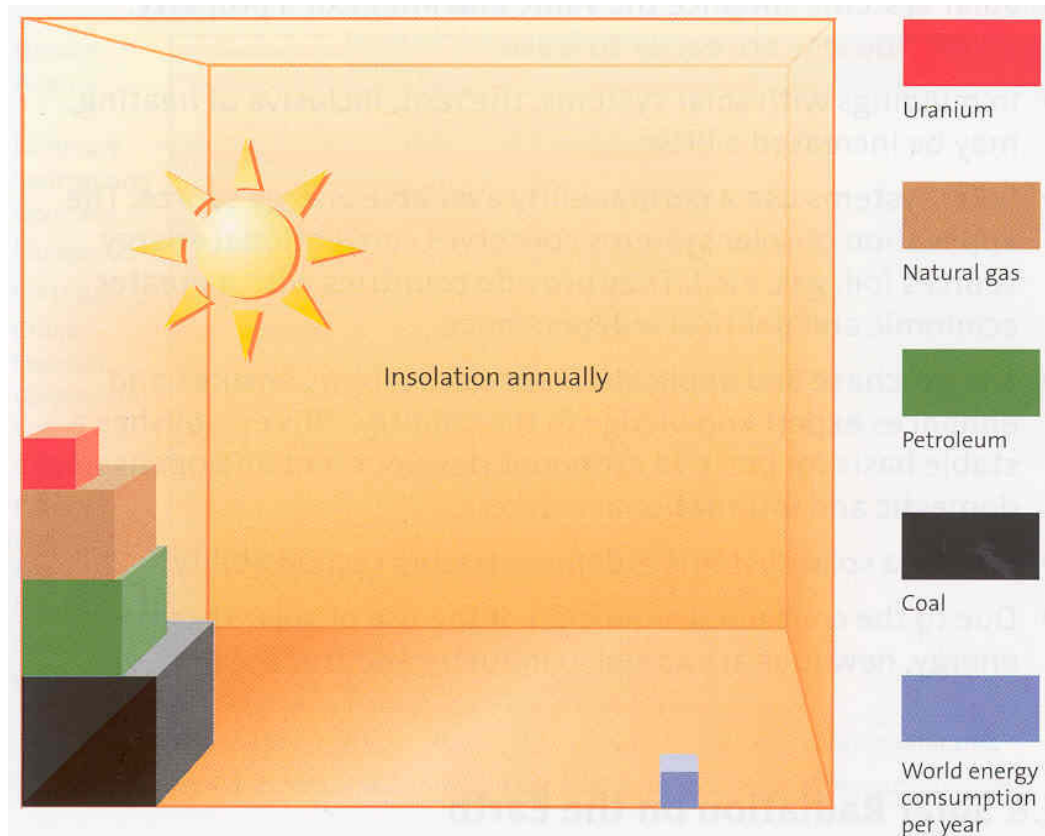
Capital Costs of Renewable Energy Technologies Electric Power per kW



International Energy Agency, WEO 2004

Solar Energy

- Low-grade thermal energy for heating our homes and businesses
- Medium-grade thermal energy for running some industrial processes
- High-grade thermal energy for driving turbines to generate electricity
- Electrical energy, converted directly from sunlight, to provide electricity for all of its myriad applications and even
- Thermal energy in hydrogen (via water splitting using photovoltaic of thermo-chemical processes to split water), for use in fuel cells and a broad range of electrical, heating, and transportation applications

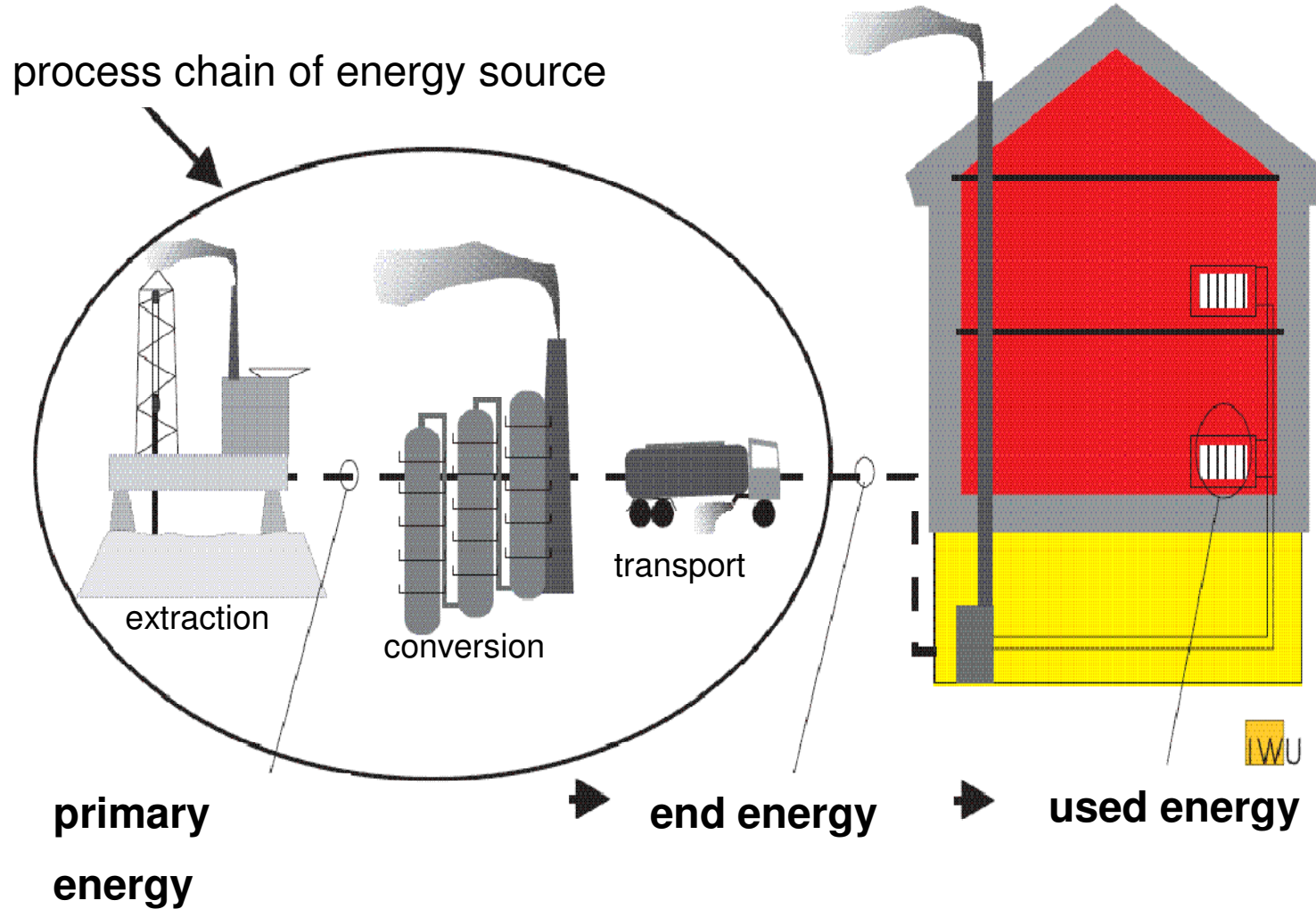


Energy Efficiency

solar info

center

Primary Energy, End Energy, Used Energy



Solarthermal - water heating systems


- simple systems
- optimized design instead of high technologies

requirements:

- low costs
- save use
- low energy
- low noise
- comfort



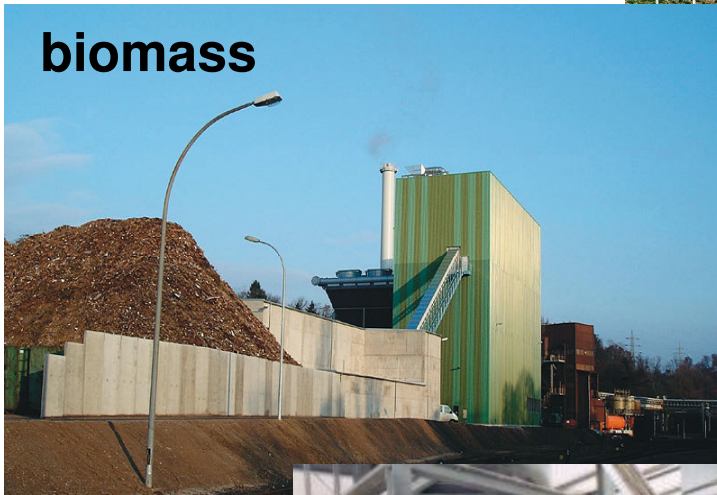
Proposal solar info center:

solar info
center 

Solarthermal Power Plant Juragua, Cuba



biomass



windfarm

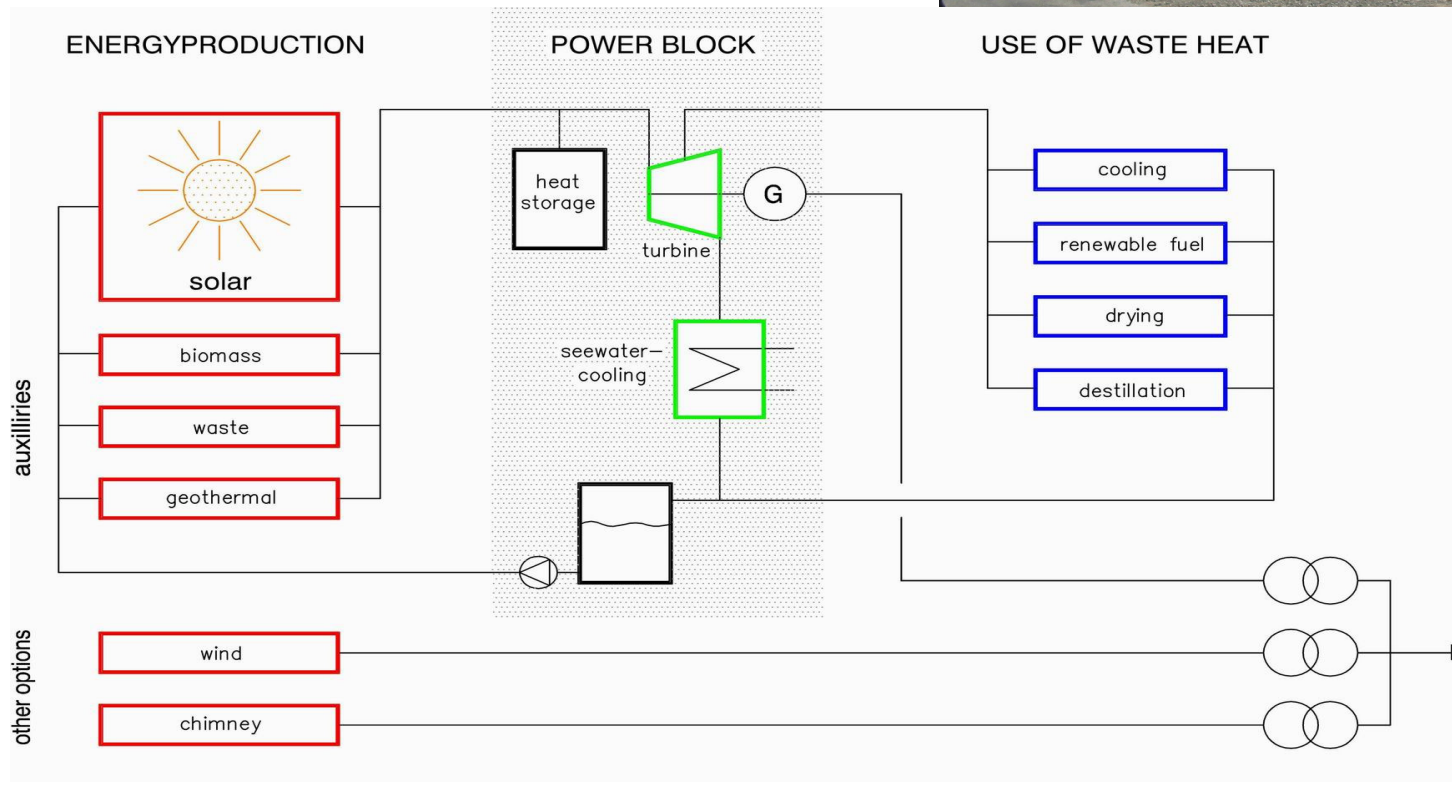


sewage sludge



Proposal SIC:

Solarthermal Power Plant Juragua, Cuba



Fotovoltaik – stand alone systems



PV in architecture: Bremgarten, publishing company



quelle: triolog-freiburg

PV in architecture: Freiburg, Badenova - Stadium



quelle: badenova

PV in architecture: Freiburg, Heliotrop



quelle: Nemec



PV in architecture: Denzlingen, community center



quelle: triolog-freiburg

PV in architecture: Freiburg, New Trade Fair



quelle: triolog-freiburg

PV in architecture: Freiburg Vauban, Solar Garage



quelle: triolog-freiburg

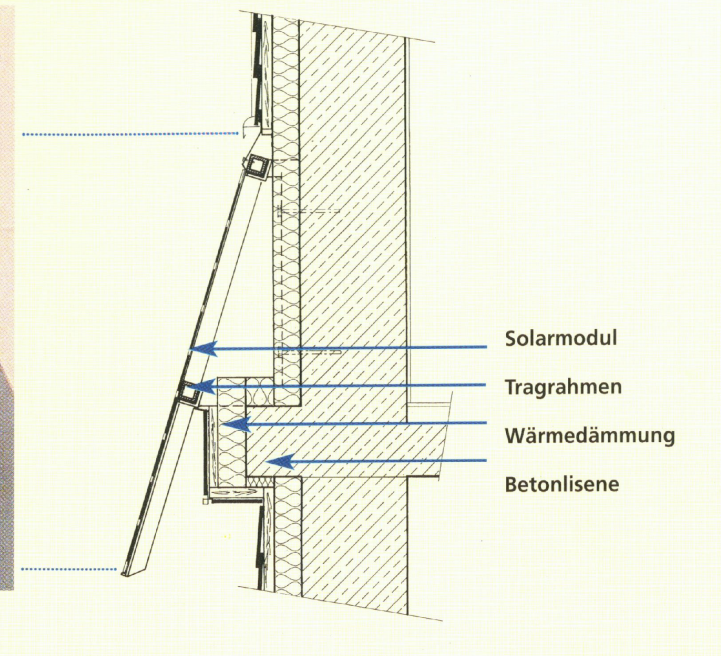
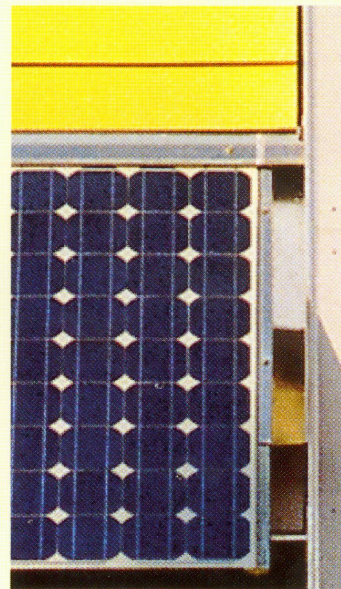
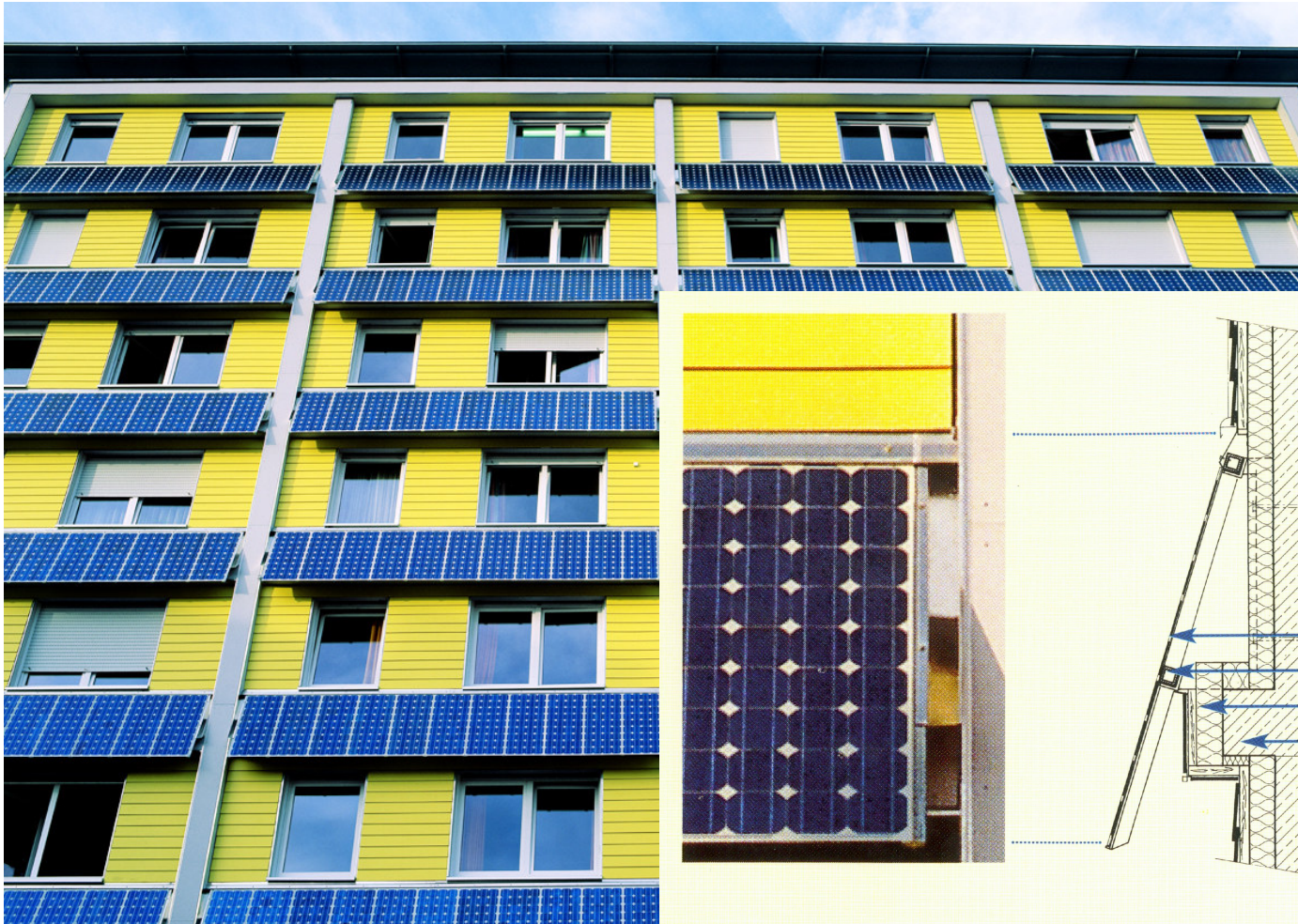
PV in architecture: Freiburg, Fischer-Production



quelle: triolog-freiburg



PV in architecture: Freiburg, catholic rooming house



quelle: triolog-freiburg



PV in architecture: Freiburg, Main Station, Tower



quelle: Fraunhofer ISE | harter + kanzler



PV in architecture: Freiburg, Solar-Fabrik AG



PV in architecture: Freiburg, Christaweg



PV in architecture: Freiburg, Fraunhofer ISE



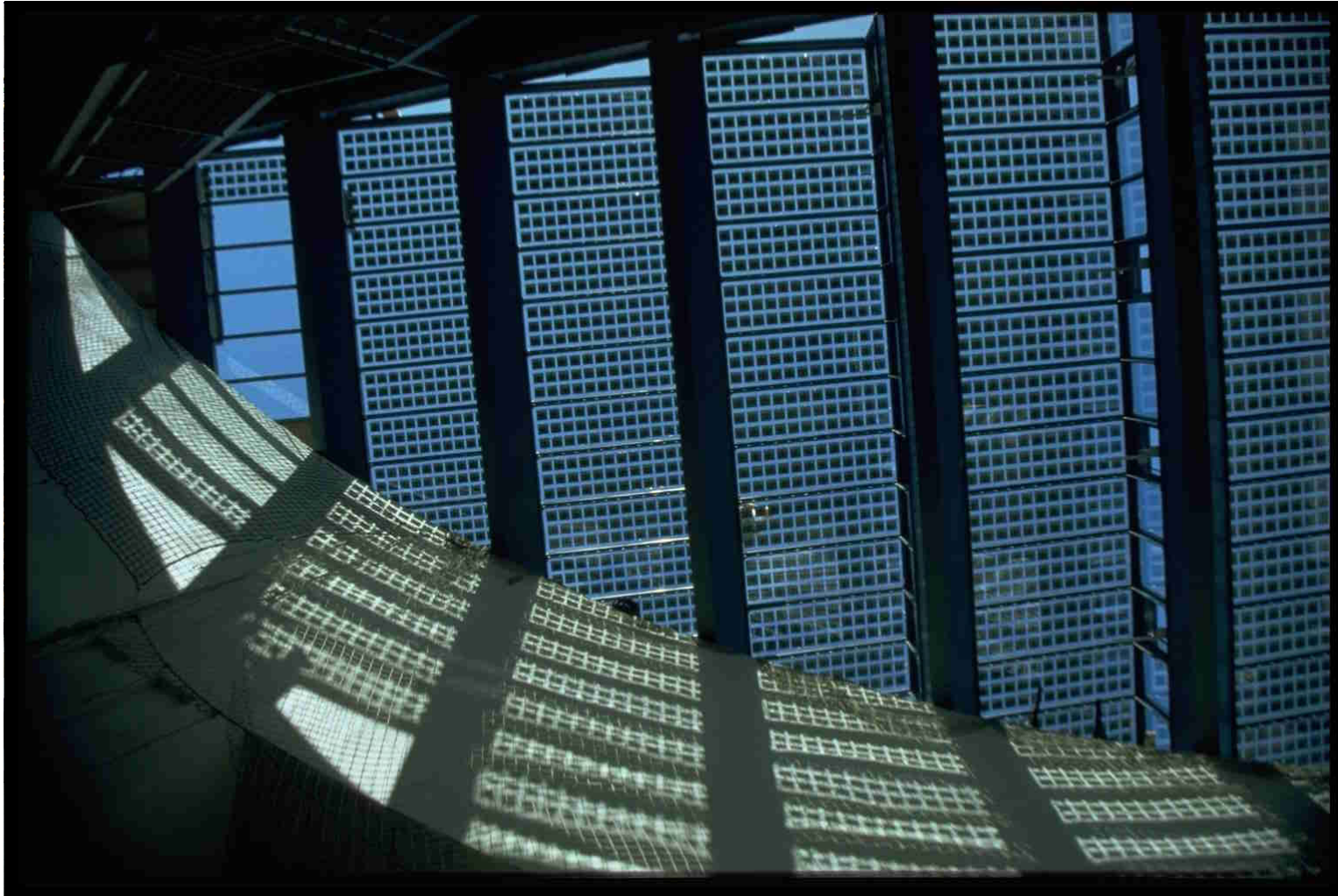
quelle: Fraunhofer ISE

PV in architecture: Freiburg, Fraunhofer ISE



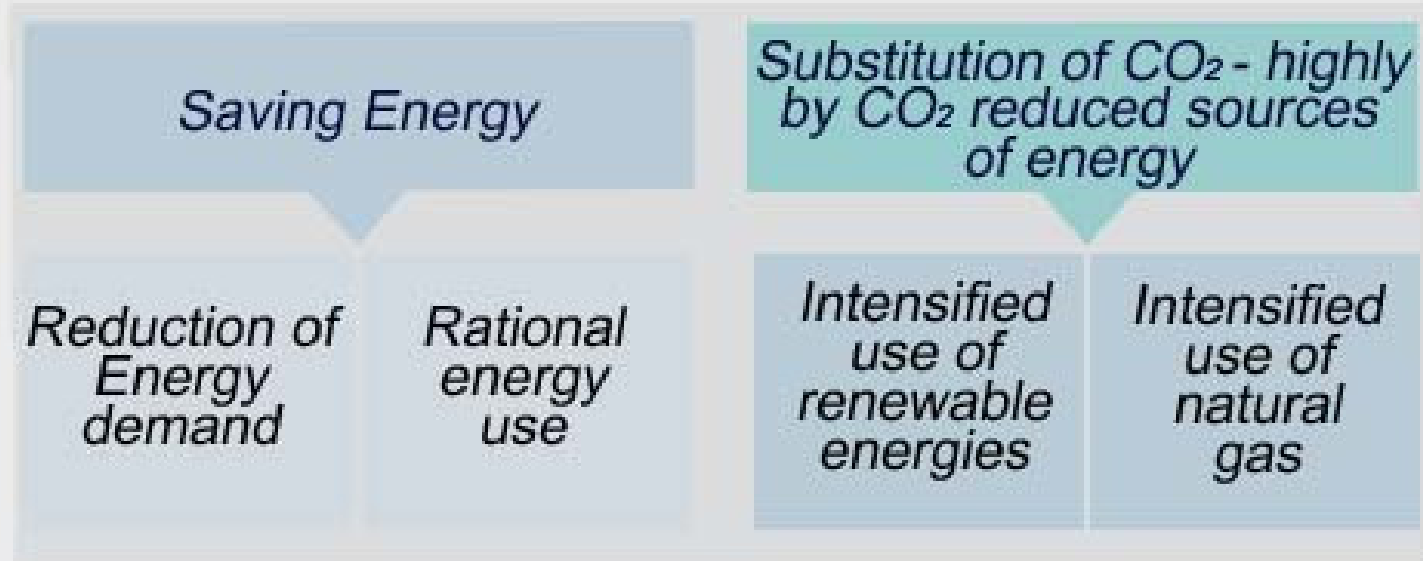
quelle: Fraunhofer ISE

PV in architecture: Freiburg, Fraunhofer ISE



quelle: Fraunhofer ISE

Possibility for lowering the causes of Emissionen from CO₂



lowering the energy associate with the emissions of CO₂

Low Energy Non-Residential Buildings

Request

solar info

center



Integral Design and Simulation

- minimized heat loss
- minimized cooling loads
- heating and cooling with environmental energy
- effective sun protection
- optimal use of daylight

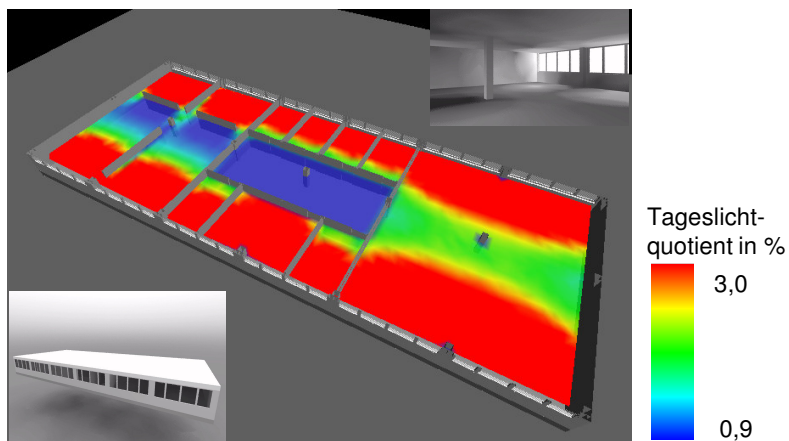


optimal quality

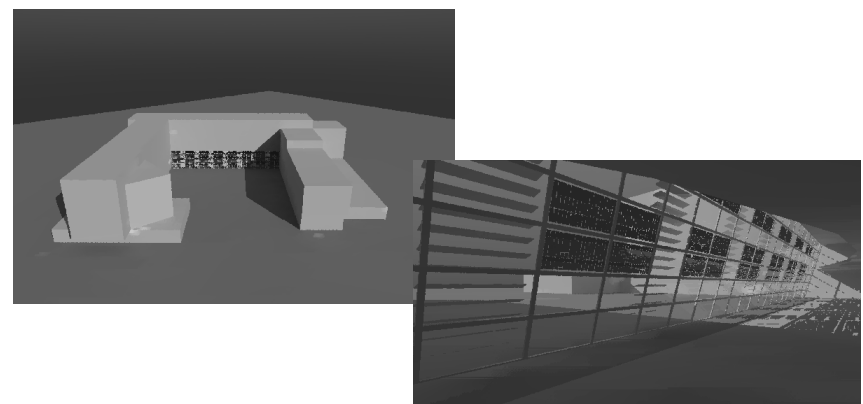
Day light and Shading

- Active simulation during planning
- bright office space through intelligent planning
- No overheating in summer because of systematic shading systems
- The adjustment control of the blinds reacts on temperature as well as individually for each office unit

Daylight Simulation

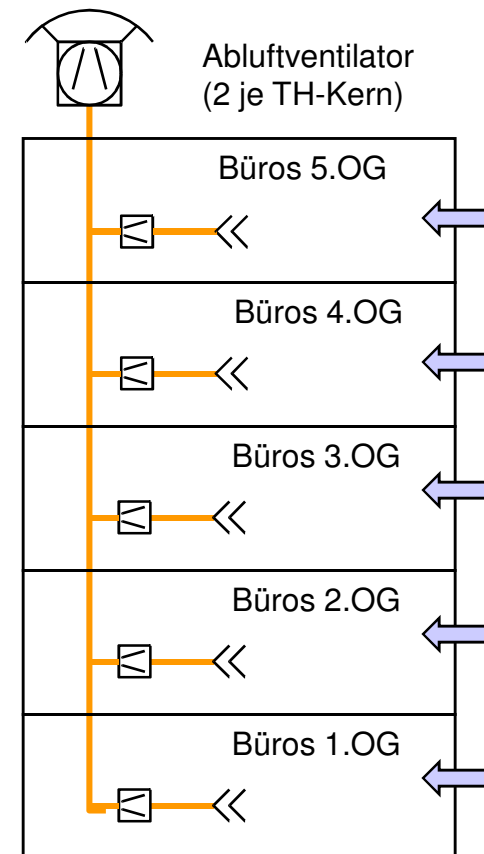


Shadow Studies



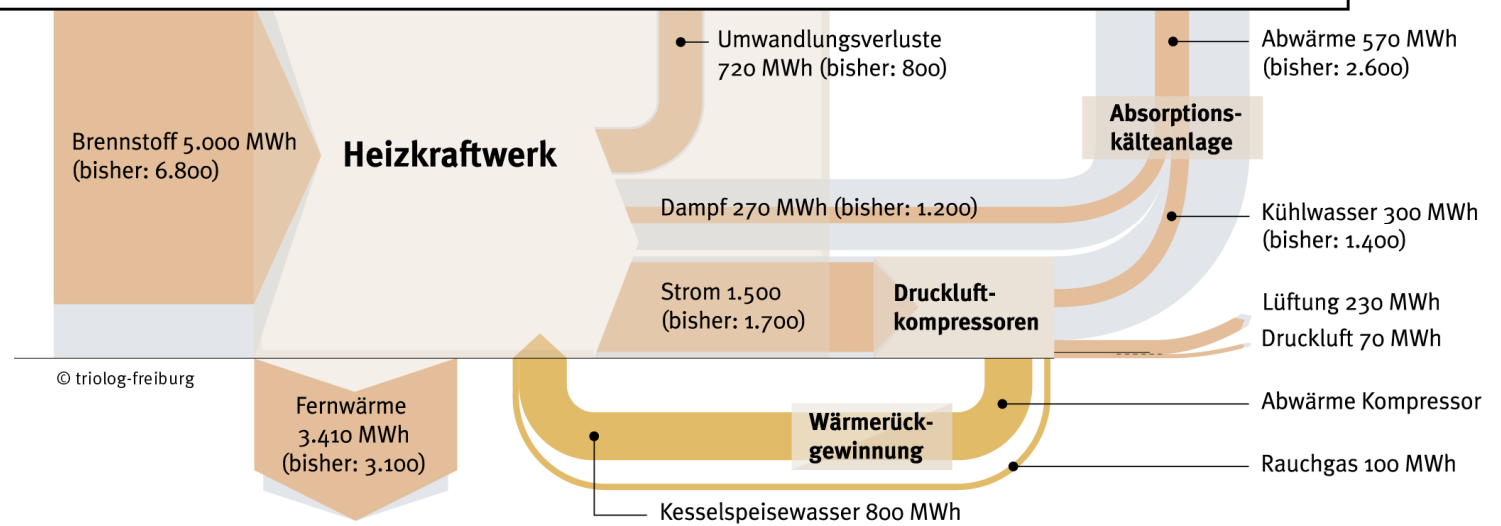
Automatic Ventilation

- Exhaust air ventilation in combination with air intakes in the walls assure constant fresh air
- Cooling in summer through night air cooling
- The massive walls store the cool temperatures from night into the day
- No suspended ceilings



Reduction of Emissions

- There is a pipeline running through the site coming from the district heating system network at the university hospital.
- We use the pipeline and receive the heat from a newly installed heat recovery system at this district heating system
- The production of the thermal heat is emission-free by 100%.



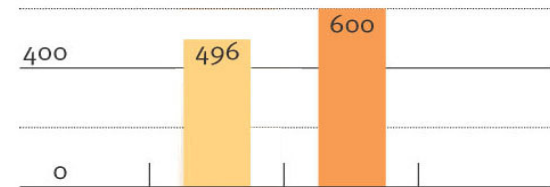
Contracting

- The Solar Info Center finances part of the newly installed heat recovery system by contracting
- The heat recovery system delivers more energy than the Solar Info Center needs
- No additional cost for user and investor compared to conventional system because of the reduced energy consumption of the building.

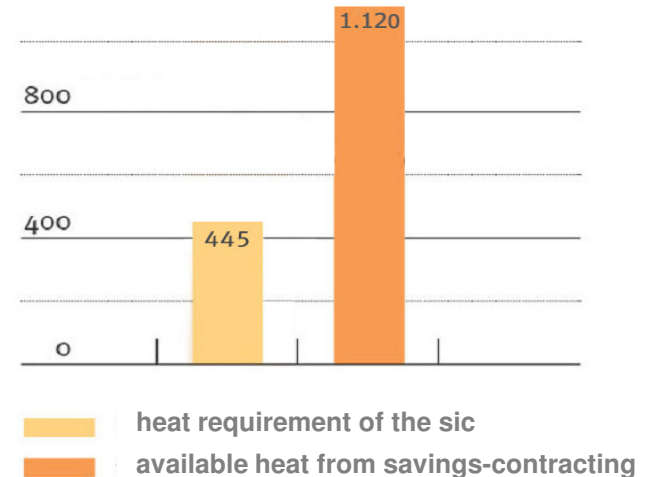
Result of the monitoring of the first 3 years:

The heat recovery produces double the heat consumption of the Solar Info Center

Heat Recovery
certified planning figures



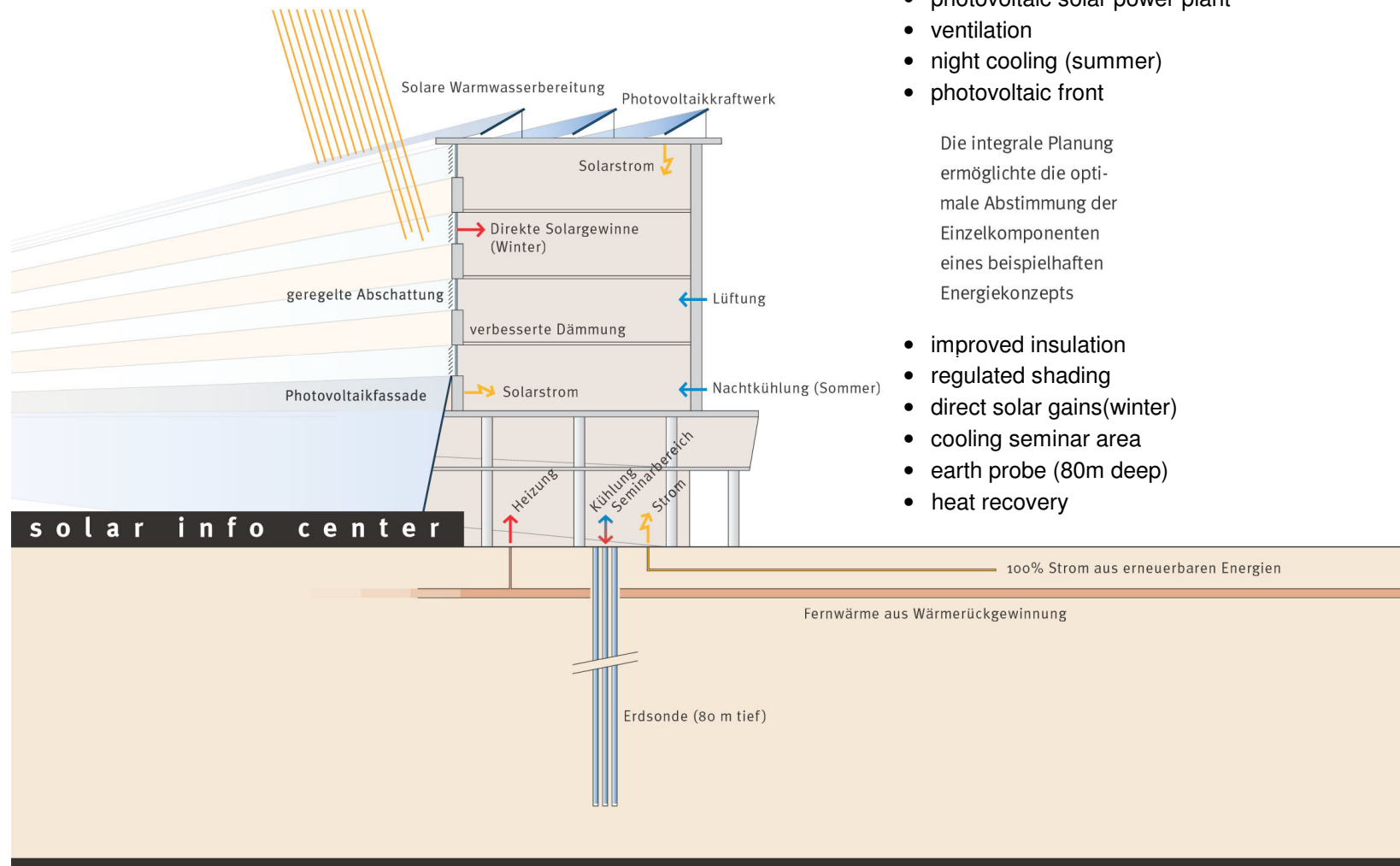
Heat Recovery
monitored results 2005 - 2007



Overview Energy Concept

• useful floor area	14.500 m ²
• gross volume	58.000 m ³
• external surface	0,25
• heating energy demand	23,4 kWh/m ² a
• energy requirement without working tools	24 kWh/m ² a
• installed light performance	10W/m ²
• heat output	450 kW
• fotovoltaik	65 kWp
• solar thermal	38m ²
• technology costs	ca. 200€/m ²

Solar Info Center – Freiburg, Germany



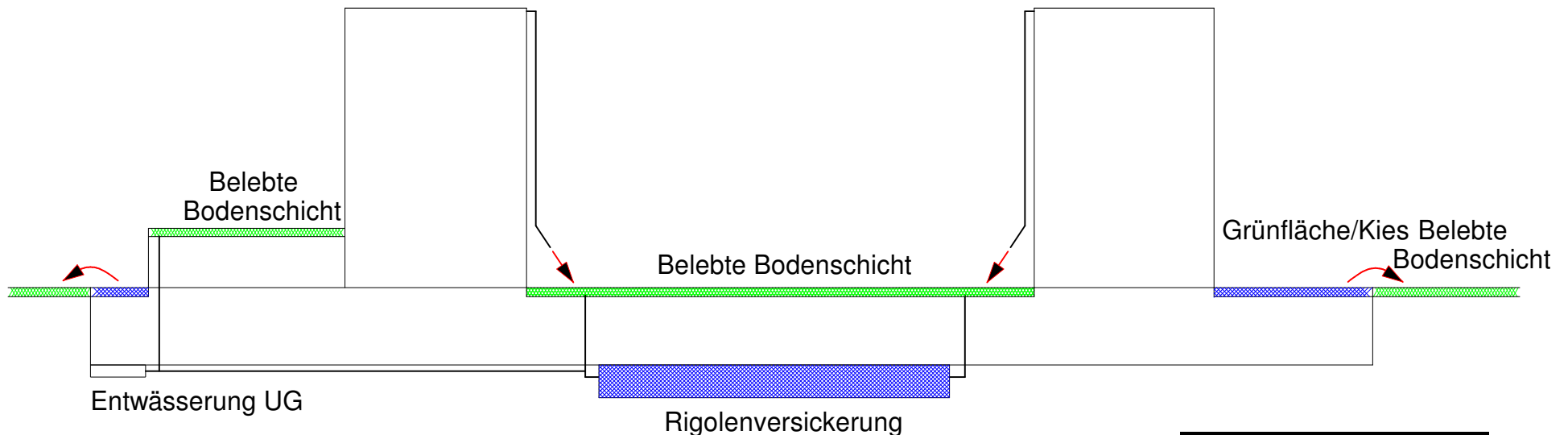
- solar warm water production
- photovoltaic solar power plant
- ventilation
- night cooling (summer)
- photovoltaic front

Die integrale Planung ermöglichte die optimale Abstimmung der Einzelkomponenten eines beispielhaften Energiekonzepts

- improved insulation
- regulated shading
- direct solar gains(winter)
- cooling seminar area
- earth probe (80m deep)
- heat recovery

Rainwater concept

- The courtyard is full of plants. The whole rain water of the site can drain away on the planted areas.
- The draining water meets the ground and goes through pipes down under the basement where it can drain away.



district heating

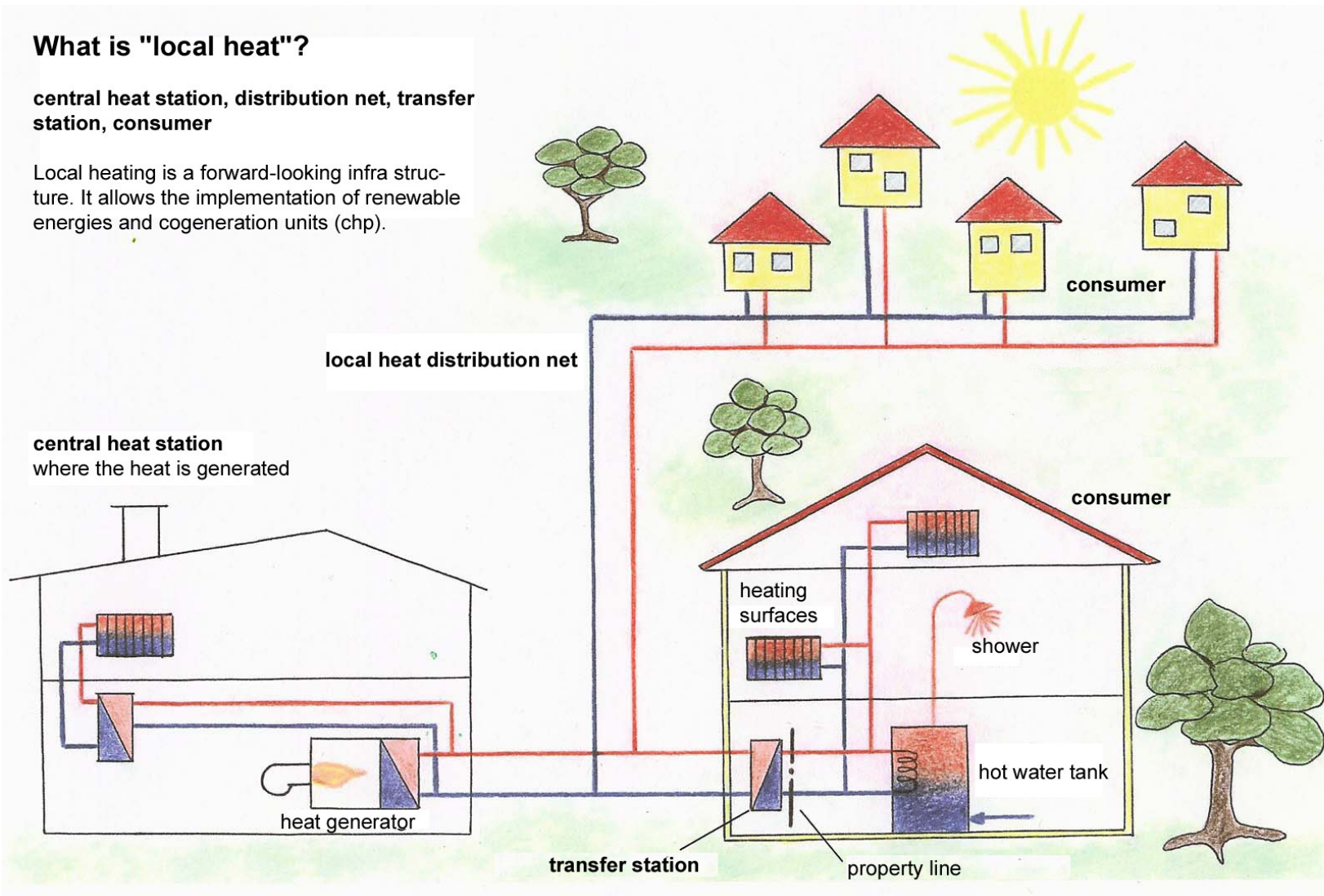
solar info

center

What is "local heat"?

central heat station, distribution net, transfer station, consumer

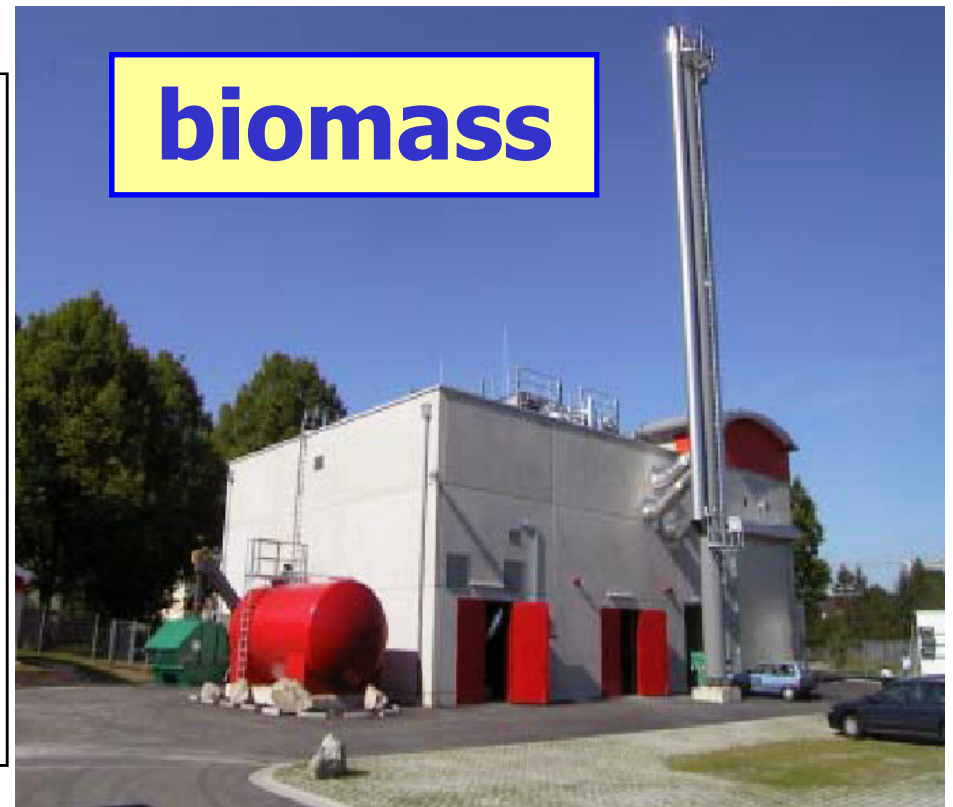
Local heating is a forward-looking infrastructure. It allows the implementation of renewable energies and cogeneration units (chp).




Ecological Energy supply

District heating systems

- cogeneration unit disposal gas
- fermentation of bio waste
- rape- cogeneration plant
- wood-fired cogeneration plants



district heating

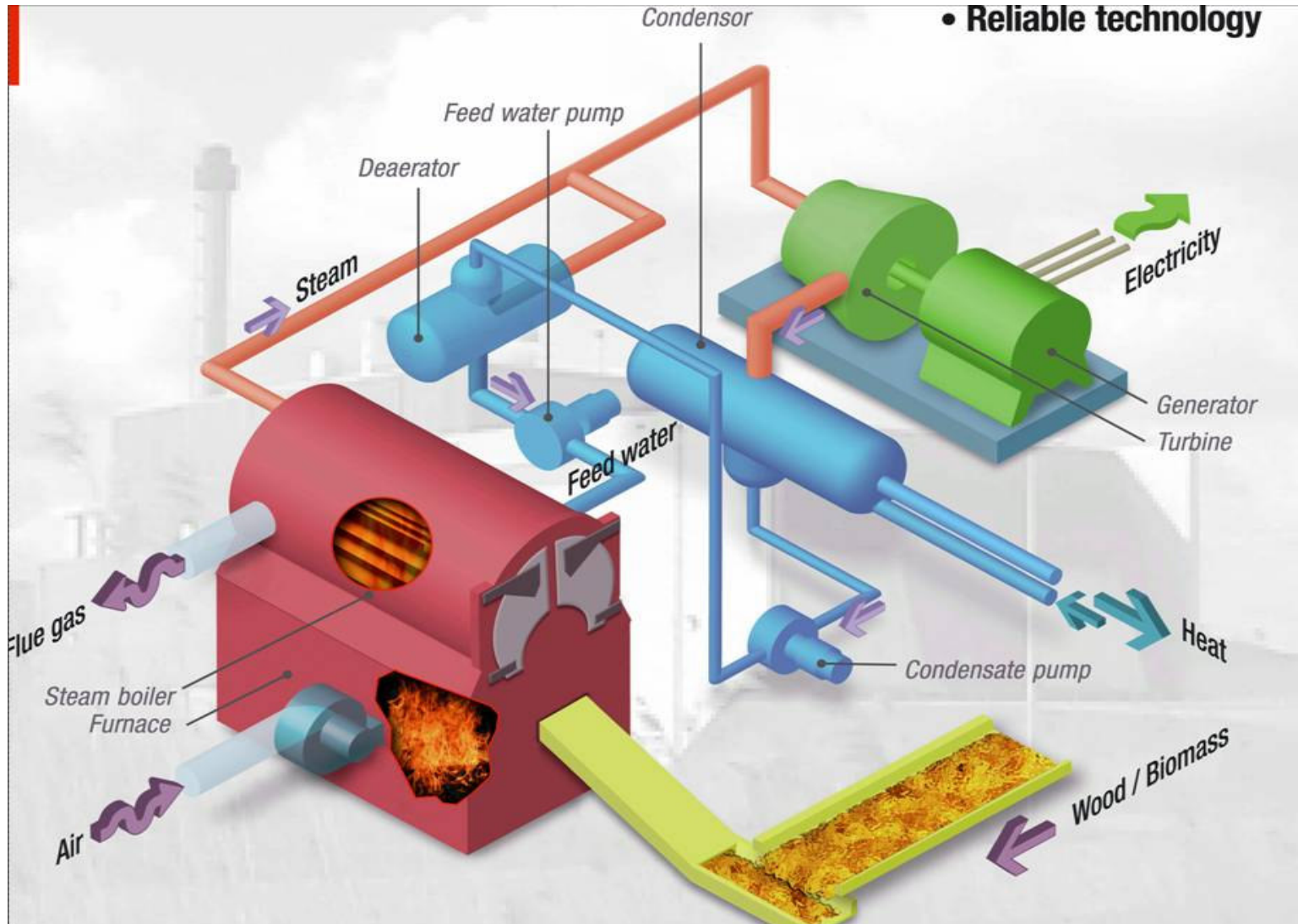
solar info
center 



district heating

solar info

center



district heating

solar info

center

OPTIMIZE THE ENERGY MIX

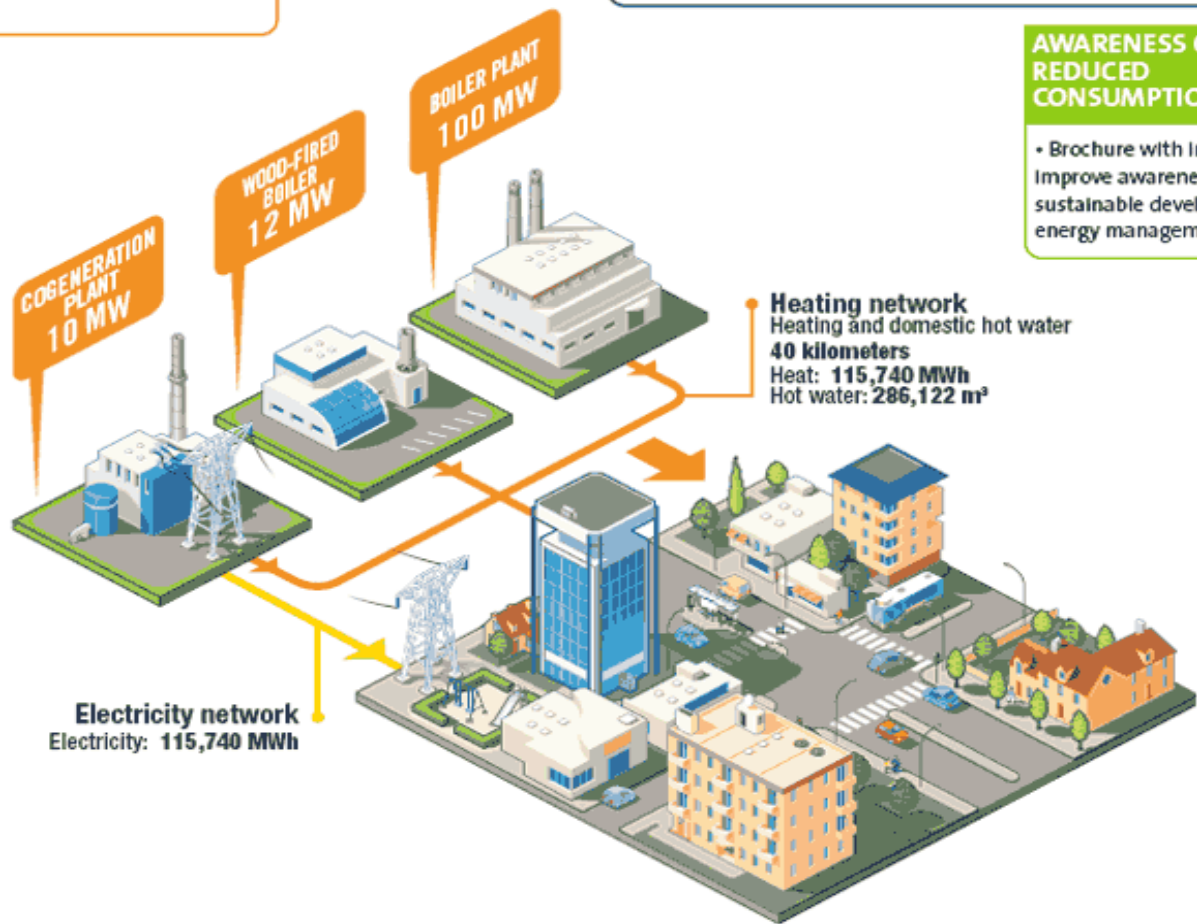
- Fuel used:
 - Heating oil: 43%
 - Gas: 42%
 - Wood: 15%
- Reliance on heating oil: 100%
In 2000, only 40% In 2006

REDUCE ENVIRONMENTAL IMPACTS

- In 2000, installation of continuous emission measurement and analysis equipment
- Renewable energy as a percentage of the total energy consumed: 15%
- Emissions avoided:
 - 6,880 metric tons of CO₂ in 2002; 19,700 metric tons of CO₂ in 2006
 - 30% less dust particles compared with 2002
 - 44% less sulfur dioxide compared with 2002

AWARENESS OF REDUCED CONSUMPTION

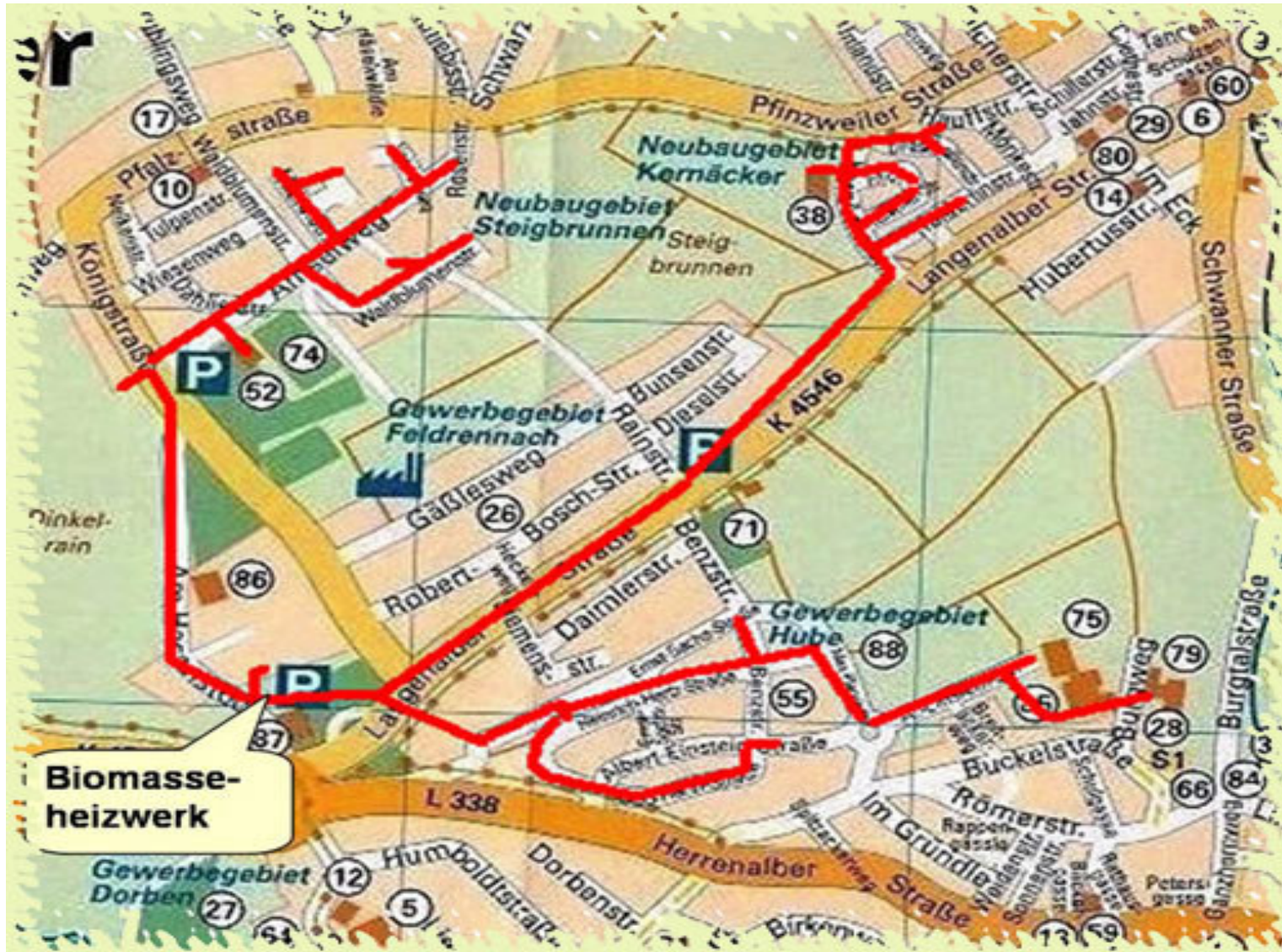
- Brochure with information to improve awareness of sustainable development and energy management



district heating

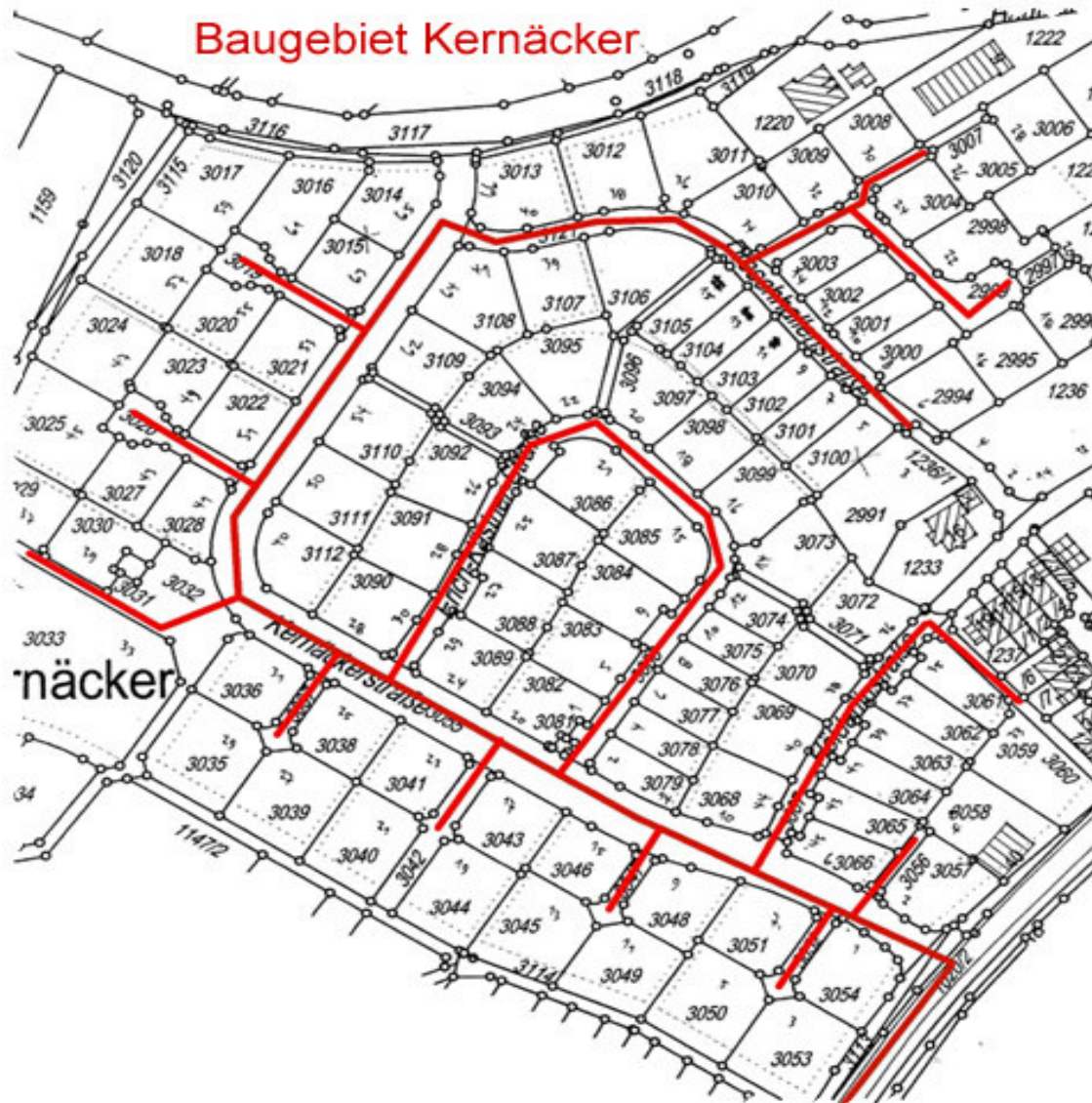
solar info

center



district heating

solar info
center



district heating

solar info

center



tight transfer station

district heating

solar info

center



transfer station (basement)

district heating

solar info

center



insulated tubes

Heat plant, University hospital, Freiburg

- Substitution of a dieselengine emergency power generator by a gasengine-cogeneration unit (CHP)
- integration of unit in the steam generation process
- Combined process: engine waste heat and exhaust gas heat (500 °C) used for preheating of boiler feed water
- Stand-alone system in case of a power supply system breakdown



Capacity of the CHP

electricity: 1552 kW

heat: 808 kW from engine waste heat

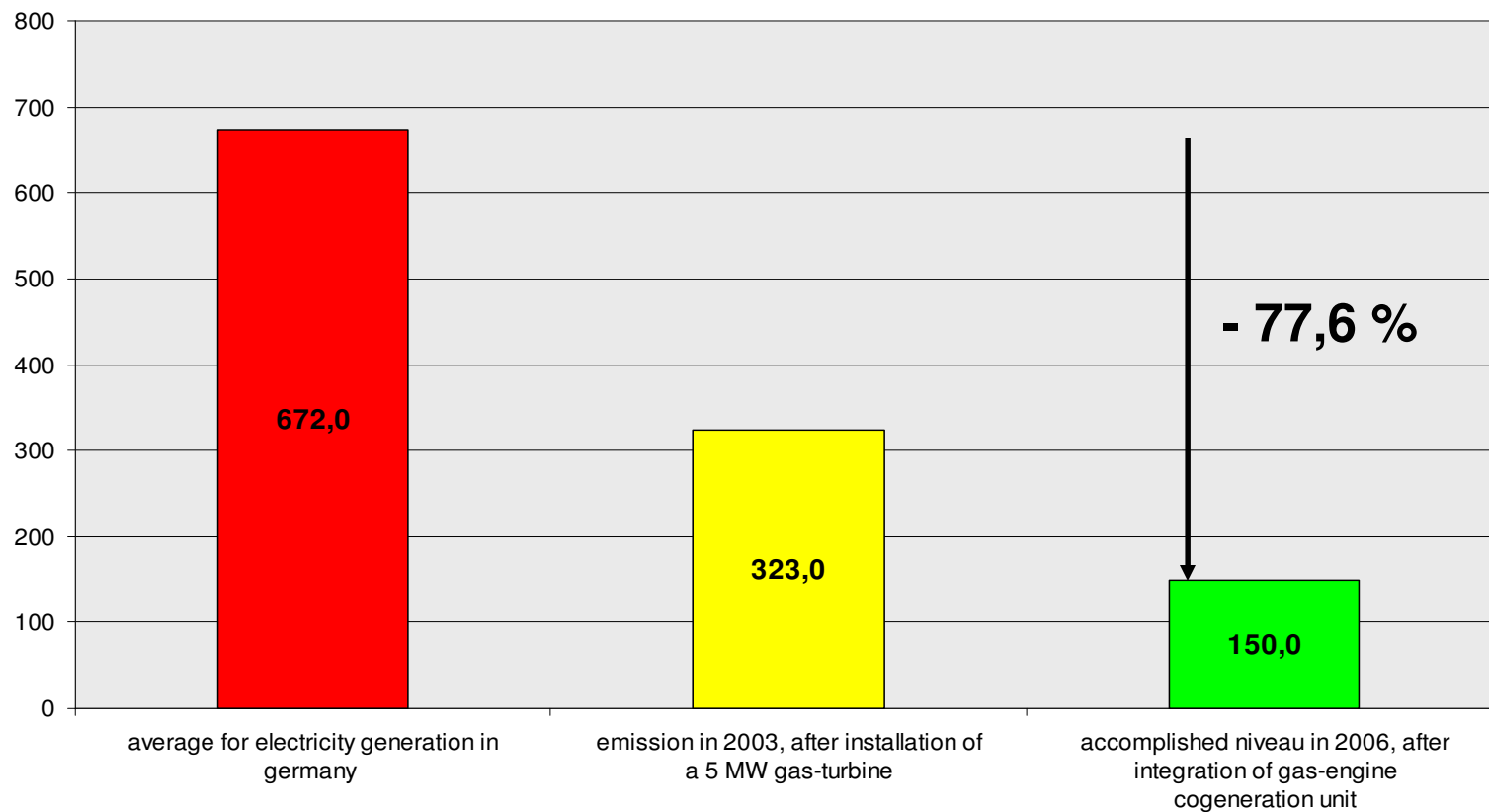
869 kW from exhaust gas heat



**CHP
of the
month**

Cogeneration unit (CHP) of the month, February 2007

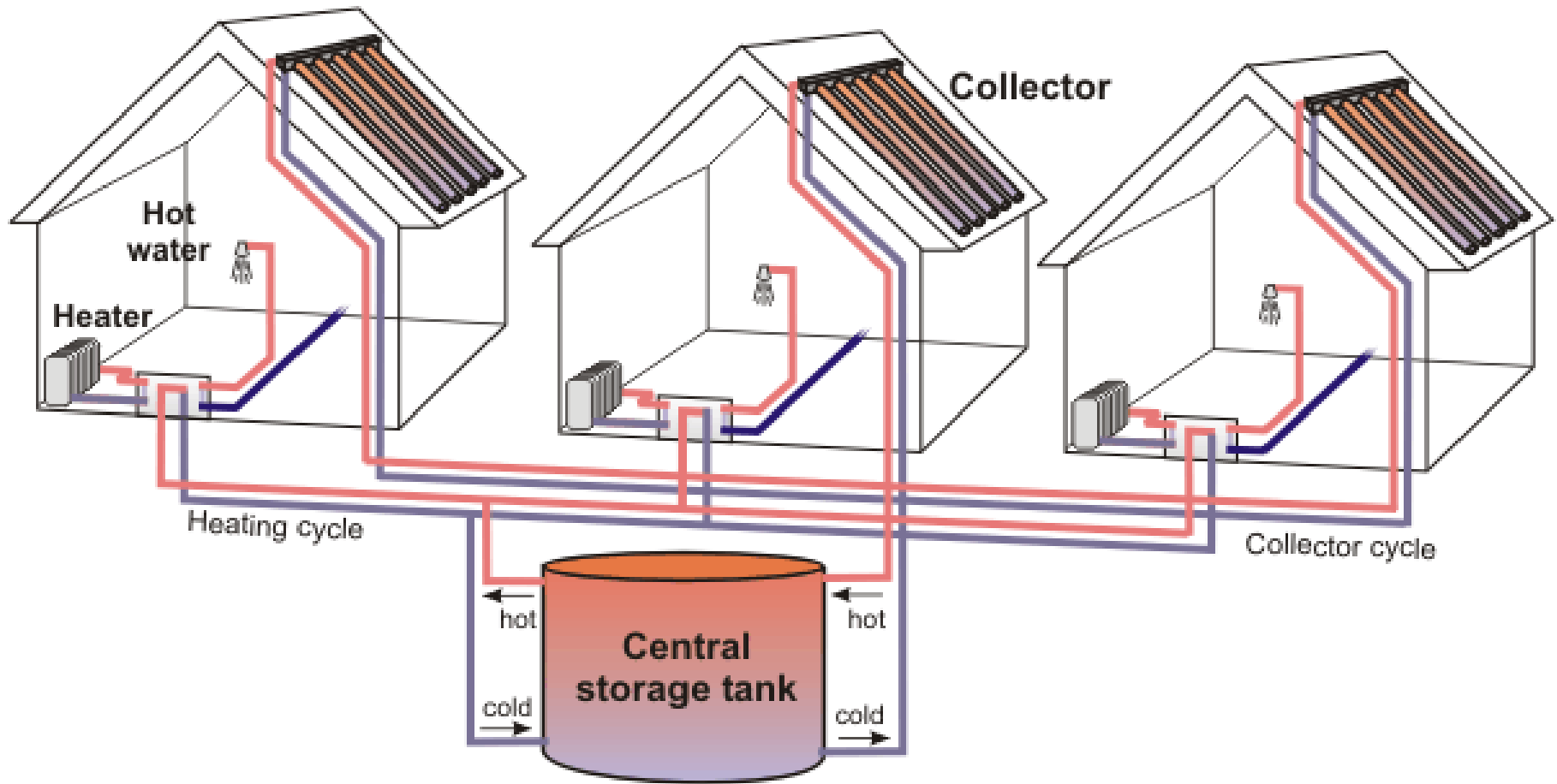
CO₂ – reduction [g/kWh]



Return of investment : 2.6 years !

Quelle: E&M Magazine, 15. February 2006

solar heating – seasonal storage

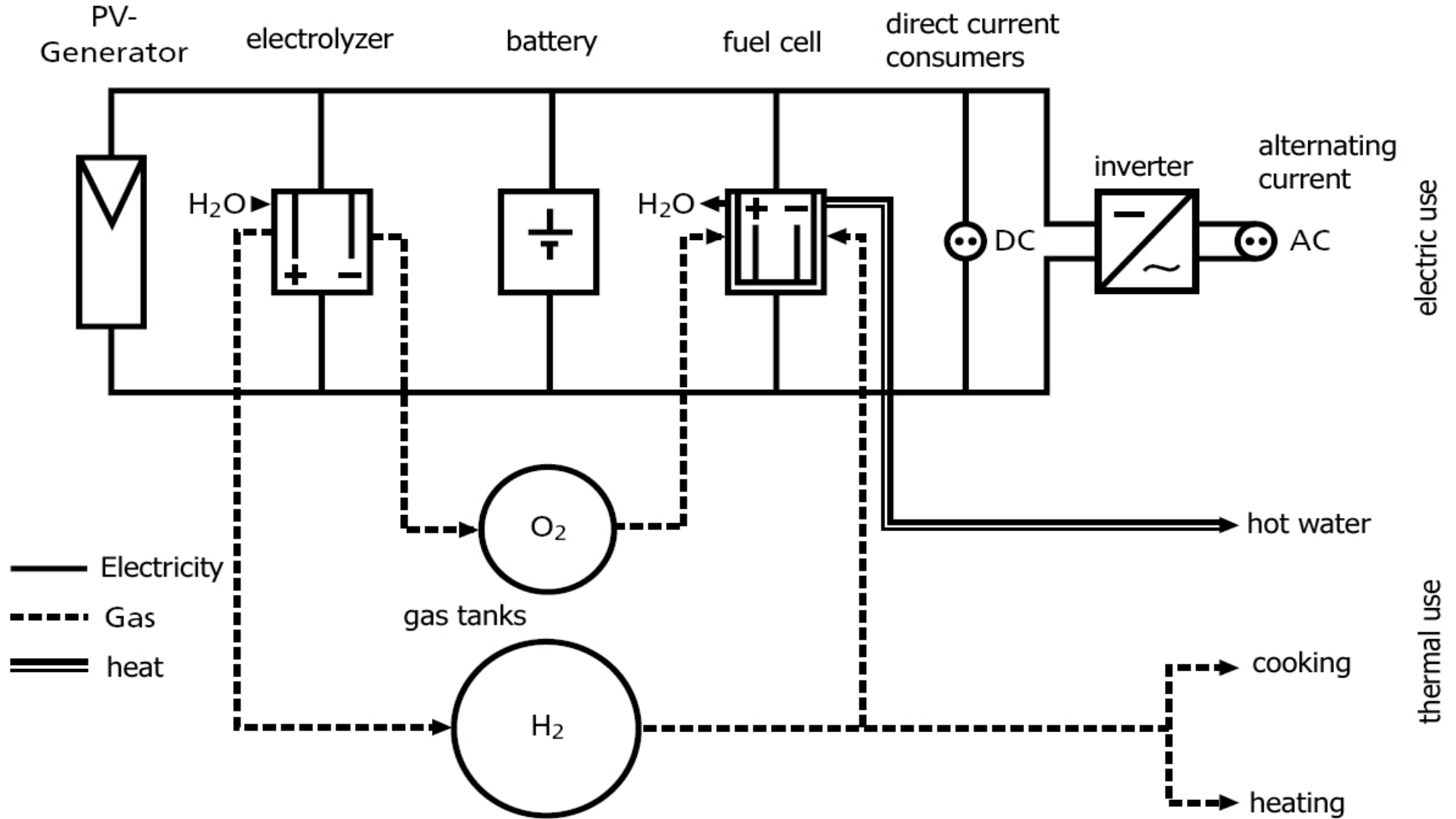


solar house in Gundelfingen (13 apartments)



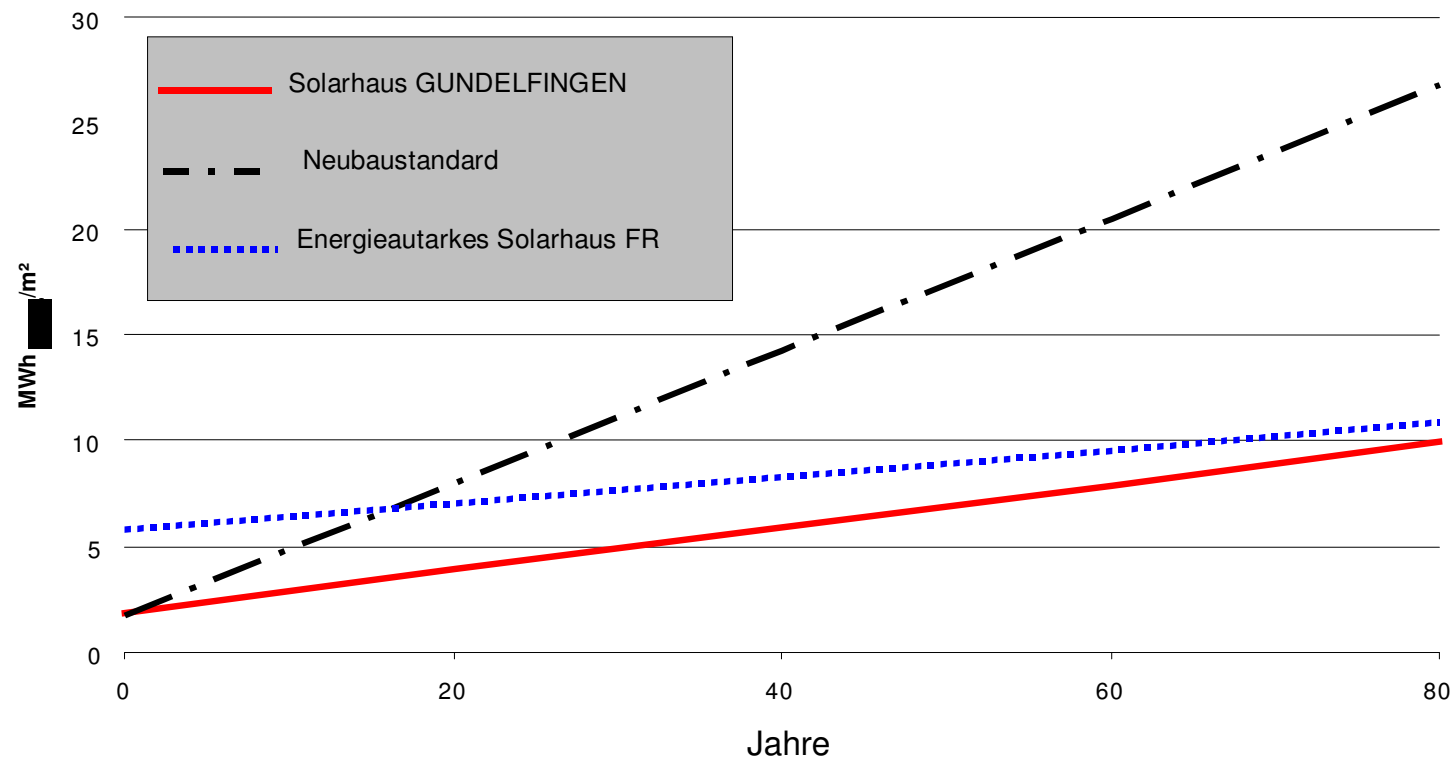
Das Energieautarke Solarhaus. Südansicht.
(Quelle: Koslik)

solar house in Freiburg



Total energy requirement

for the production, use and maintenance during a period of 80 years



Thank you very much for your attention !

